

1

Gynecological History Taking and Examination

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INTRODUCTION

In this chapter you will find instructions on how to perform basic gynecological history taking and examination. A full gynecological history and examination consists of at least a full history regarding general health, gynecological signs and symptoms, breast signs and symptoms and an abdominal, speculum and bimanual examination. Consider opportunistic screening for cervical cancer using visual inspection with acetic acid (VIA)/visual inspection with Lugol's iodine (VILI) (see Chapter 26) during each speculum examination and do clinical breast palpation if there are positive points in the patient's history. Offer HIV counseling and testing to each patient. If you can organize it, offer health promotion on reproductive health issues to your waiting clients, e.g. through video clips, flyers or other information material or education through another health provider.

We have included the examination of the breast here as well although in many countries this is not done in gynecological services but by the surgical department. However, literature on health system strengthening suggests that service integration is more cost-effective and makes better use of the available human resources. In addition, breast cancer incidence is increasing worldwide and in resource-poor settings patients often present late with breast cancer with a bad prognosis.

HISTORY TAKING

History taking is the cornerstone of any diagnosis and treatment. Most people think that sophisticated investigations always lead to proper diagnosis and good treatment, but a thorough history can already identify 90% of diseases.

Keep in mind that to most patients you are a complete stranger and their problems are related to an area of their life they would normally not discuss with a stranger. In order to reveal all important information to you, they need to trust you first. So, the main aim of the first minutes of your conversation is to build up a trustful relationship with your patient. You will reach this aim by treating her in a friendly, empathetic and respectful manner. This means apart from greeting her, that you listen attentively to what she has to say and encourage her to tell you everything that might be important. Most people have their own theory of where their symptoms come from as this is part of their decision-making process to seek medical advice. Take those theories seriously. In reproductive health care you may be confronted with some behaviors or people you personally disapprove of, e.g. induced abortion, sexually transmitted diseases, sterility treatment, sex workers. Don't be judgmental.

Here are some basic questions you may ask. More disease-specific questions will be described in the respective chapters:

Personal data

- Age
- Marital status
- Occupation

Current problem

- Actual complaints
- Onset and duration of symptoms
- Relation to menstrual cycle
- Previous investigations and treatment for actual complaints

GYNECOLOGY FOR LESS-RESOURCED LOCATIONS

Micturition

- Incontinence: involuntary loss of urine (stress incontinence, urge incontinence; see Chapter 23)
- Nocturia (voiding once or more during night time)
- Oliguria/anuria (little or no urine)
- Macrohematuria (bloody urine)
- Dysuria (painful voiding)
- Hesitancy (difficulties initiating micturition)

Bowel habit

- Constipation
- Diarrhea
- Bloating
- Flatulence

Menstrual history

- Age at menarche (the very first menstruation)
- Last two menstrual periods with duration of bleeding and length of cycle, could this patient be pregnant now?
- Dysmenorrhea
- Amount of bleeding (clots, flooding)
- Spotting (small amount of bleeding at midcycle)
- Postcoital bleeding

Past obstetric history

- Parity, number of alive children, mode of delivery, complications
- History of miscarriages, abortions, infertility, present desire for children
- Previous or actual use of contraceptives and type of contraceptives, wish to start using contraceptives

Past gynecological history

- History of sexually transmitted infections (STI) symptoms (abnormal vaginal discharge, lower abdominal pain, genital ulcers)
- Previous abdominal and vaginal operations
- Nipple discharge

Sexual history

- Current relationship
- Number of previous partners

- Dyspareunia
- Sexual trauma (abuse, rape etc.)

Medical history

- Previous medical conditions (thromboembolism, bleeding disorders, diabetes, hypertension, tuberculosis, endemic diseases (e.g. sickle cell anemia, thalassemia, schistosomiasis))
- Ever tested for HIV? If yes, when? Every patient should be offered counseling and testing for HIV in high-prevalence areas
- Nicotine and alcohol intake
- Actual medication?

Family history

Here you look for a pattern that might hint to genetic causes. Ask if any directly related family member (sister, mother, grandmother, father, brother, grandfather) got sick with or died of the following diseases:

- Hypertension
- Diabetes mellitus
- Thromboembolism
- Breast cancer
- Ovarian cancer
- Bowel cancer
- Prostate cancer.

EXAMINATION

A complete gynecological examination should always be performed. To get the most information out of your work-up you should always explain to the patient what you will do and why. You should bear in mind that many patients who come to you with a specific problem took a lot of effort to raise the money for their trip to your facility. So every visit is an opportunity to check for other reproductive health problems and not only for the one they came for. If you do a complete gynecological examination you won't miss most of the problems even before the patient becomes aware of them herself. Remember as well that some problems might be interlinked: a patient suffering from an STI for example is at risk for HIV and for developing cervical cancer later.

Equipment needed

Think of what you need for your examinations and have your equipment ready before you start. It is very difficult to interrupt your examination and get equipment in between.

- Gynecological examination chair or stretcher with pillow (to put under the patient's buttocks)
- Washing basin, soap
- Light source (either static or head lamp)
- Clean specula [specula don't need to be sterile but in pregnant patients, they should be cleaned and soaked in 0.5% chlorine solution (high-level disinfection) before use. So you need to make sure to have enough clean specula for a day]
- Clean gloves
- Lubricant if available, otherwise warm, clean water
- Microscope with at least 40x magnification
- Slides
- Sodium, potassium chlorate
- Swabs for wet mount and stains

Additionally you might need:

- Sponge-holding forceps for cleaning
- Dissecting forceps
- Cervical biopsy forceps
- Silver nitrate sticks or tranexamic acid
- Vaginal pack
- Manual vacuum aspiration (MVA) kits with various sizes of cannulas
- Indwelling bladder catheters of several sizes
- Tuberculin syringes for postcoital tests
- Vulsellum
- Lignocaine 1 or 2%
- Acetic acid 5% and Lugol's iodine solution for VIA and VILI
- Cyto brushes for Papanicolaou (PAP) smear if available
- Fixation agent for cytological specimen

Privacy

It is very important to ensure privacy for a gynecological examination otherwise your patients will feel embarrassed and will never come back even if they have problems. If you are the only health provider in your area this will make them lose money and time. Think of what amount of privacy you would need yourself for such an examination to feel comfortable. The first pre-condition is that no

other person can enter the room without permission. Thus, your door should have a lock and you should use it. If it is absolutely impossible to lock the door, there should be at least a sign of 'no entry without permission' in the local language.

When examining the patient you should always explain what you are going to do, so that she can prepare herself. Speculum examinations and bimanual palpations can be very painful if the patient is unprepared and scared as she will contract her pelvic muscles, especially if she is already experiencing pain due to her condition.

Offer a drape or let her use her own shawl or cloth to cover up while doing a genital examination. There is a way to let her do this and still be able to perform your examination correctly. Just try out how this is best done.

During a gynecological examination your patient is showing her most intimate parts to a stranger. You should respect her fears and embarrassment and not insult her or shout at her even if she is reluctant to position herself the way that is needed for examination. Empathy, respect and friendliness are more helpful in such situations.

If you are a male provider you might consider having one other (female) person present when you do a gynecological examination. This person is called a chaperone. Your patients might feel more comfortable with another female person around and there have been reports of sexual abuse of female patients during examination. The chaperone will as well protect you from false accusations so you should seriously consider making this a rule even in a setting where human resources are scarce. Keep in mind that a chaperone should not be related to the patient but doesn't need to be medically trained. She could be a volunteer from a community group or a medical staff or student not on duty.

General examination

Look at nutritional status, check temperature, pulse and blood pressure. Recording a patient's vital signs is an essential step in your examination because you will detect patients in need of emergency treatment. Signs of shock are a heart rate of >110bpm and a systolic blood pressure of <90 mmHg. These patients urgently need an intravenous (IV) line and fluid as well as rapid assessment and treatment.

Abdominal palpation

Ask the patient to empty her bladder and lie down on a bed or stretcher with her abdominal muscles relaxed. A full bladder will hurt during examination and can mimic an enlarged uterus by pushing it upwards. Inspect the abdomen for surgical scars, abdominal distention (gas, ascites) or visible tumors. On indication (e.g. if you suspect bowel obstruction) you can auscultate the abdomen.

Percuss all four quadrants of the abdomen for dullness (solid tumors, fluid), tympany (gas) or shifting dullness (fluid). Watch the patient’s reaction to your percussion, whether she feels pain or not.

Palpate the area below the umbilicus softly with your fingertips as deep as the patient allows you. Try to find out if there are any areas where deep palpation is not possible due to pain or if you can feel any hard or soft resistance. If yes, figure out its location and whether it is mobile or not by trying to push your fingers under the mass and move it. This can help you to assess the size, mobility and consistency of the uterus or tumor and can already tell you whether an operation might be difficult in cases where the uterus is not at all mobile.

If you find an area with stronger pain this can point to peritonism. Look for localized or generalized involuntary tension of the abdominal muscles (guarding). Deeply palpate the area and then let go (rebound tenderness). If this hurts, the patient has peritoneal signs which can point to abdominal infection or ectopic pregnancy.

Inspection of the vulva

Before you start a speculum examination, inspect the patient’s vulva. You should look for:

- Normal development of the external genitals
- Skin lesions
- Hirsutism (increased pubic hair)
- Scars
- Discharge
- Swelling
- Prolapse

Speculum examination

Before you do a speculum examination you should discuss with the patient whether she has already had sexual intercourse. Although after the onset of ovulation female hormones make the vagina and

the hymenal rim elastic you should consider not doing a speculum examination if the patient is a virgin.

A speculum examination can be done in the lithotomy position if you have a gynecological chair or in dorsal position if you use a stretcher (Figure 1). The bladder should always be empty.

There are two common types of specula: a bivalve speculum and an anterior and posterior wall speculum. You can use what is available but a bivalve speculum is more handy as you don’t need any assistance to hold the upper valve in place while taking swabs etc. (Figure 2). You can use larger specula for multiparous women as their vagina is usually wider than with nullipara. The speculum should be warm and lubricated. You can even use water for this or water-based jelly as for ultrasound.



Figure 1 Gynecological examination on a stretcher

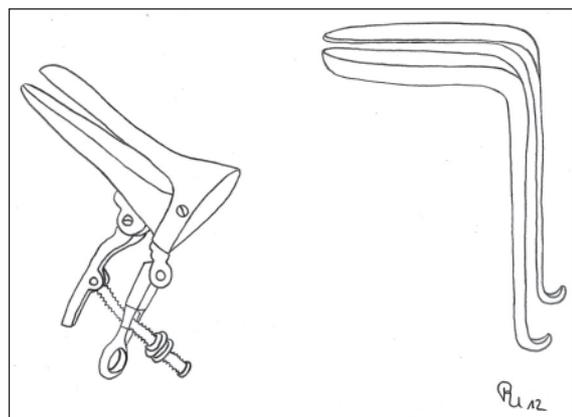


Figure 2 Bivalve speculum and posterior wall speculum

There are video clips on how to do a speculum examination available at: <http://www.medicalvideos.us/play.php?vid=363>

Here is a description on how to insert a bivalve speculum:

Wear clean gloves and direct a light source on the introitus. Separate the labia minora with two fingers of the hand that doesn't carry the speculum.

Insert the closed speculum in upwards and backwards direction (the curve of the vagina, 45° posterior) with the handle pointing to the side. Be careful not to touch the urethral orifice as this is painful. If you need more space rather push the perineum down gently. You can ask the patient to push down. While inserting the speculum rotate the handle either upwards or downwards so that the valves become horizontal. Once you have inserted the speculum fully in the vagina gently open the valves under view to find the cervix. If you insert the speculum too far you might enter the posterior fornix behind the cervix and load the cervix up on your anterior valve when opening the valves which is very uncomfortable and prevents you from identifying the cervix. Retract the speculum a little until the cervix is visible. If you can't find the cervix because the vaginal walls are collapsing they are either too wide for the size of the speculum you are using and you need to use a larger speculum or she has a genital prolapse and you would be better using a speculum with separate valves if available. For removal close the valves a bit, but not completely otherwise you might tap the vaginal wall or even the cervix, and withdraw the speculum under sight.

Here is a description on how to insert a speculum with two separate valves:

First, insert the posterior valve which is curved with the handle pointing to the side, while separating the labia. Rotate the handle posteriorly while inserting the valve as for the bivalve speculum backwards and upwards. Once you have inserted the posterior valve until it doesn't go any further you insert the anterior valve with the handle pointing to the opposite side of the patient and rotate it upwards while inserting the valve (Figure 3). Once you have done this many times, inserting the two valves will become one movement. For removal approximate both valves and pull them backwards under sight.

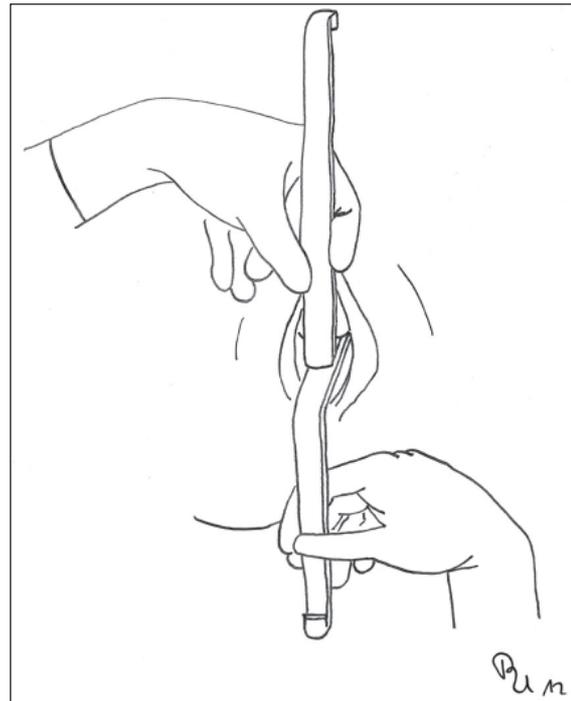


Figure 3 Insertion of the anterior valve of a posterior wall or Sim's speculum

Identify the cervix and assess whether it is in the midline or distorted and whether it is long or short. Inspect the surface of the cervix. Assess its color, smoothness and shine. Are there any disruptions of the surface? Any reddishness or whitishness? Inspect the external cervical os. Can you see any discharge or pus from the os? If yes, what is the color?

Specifically look for:

- Polyps
- Tumors
- Ulcerations
- Squamocolumnar junction
- Condylomata
- Intrauterine device (IUD) threat

Inspect the vaginal walls for tumors, ulcerations, change of color, discharge and fistula.

Now is the time to take swabs for a wet mount or stain and to do a VIA and/or VILI (see Chapter 26 on cervical cancer on how to do VIA and VILI).

Wet mount

You can assess vaginal discharge directly after examination if you have a microscope with 10 and 40x

magnification in your office. Before you finish your speculum examination, take some of the discharge you want to assess from the posterior vaginal fornix. If there is abundant discharge on your posterior speculum valve you can use this. Put a little amount of the discharge on a microscope slide. If you use too much you won't be able to distinguish single vaginal epithelium cells. Add one or two drops of normal saline and put a cover slide on top. Now you can look at the slide through your microscope. Use the magnification 10x first to find the right level and identify polygonal vaginal epithelium cells. Then turn the magnification to 40x and examine the slide closely. A normal wet mount shows epithelium cells, leukocytes and lactobacilli (Figure 4).

Here are some abnormal findings you should look for:

- *Clue cells* Normal vaginal epithelium cells are polygonal and have clear margins. Clue cells are epithelial cells with bacterial overgrowth, which can be seen as fuzzy, 'dirty' cell margins. They indicate a frequent cause of vaginal imbalance called bacterial vaginosis (see Chapter 17).
- *Trichomonas* These are larger than bacteria. They are parasites and can be identified through their rapid movements in between the epithelial cells (for treatment see Chapter 17).
- *Sperm cells* (See Chapter 16 on subfertility).
- *Yeast* Yeast can be better demonstrated by adding one or two drops of potassium hydroxide as all cells but the yeast cells are destroyed.

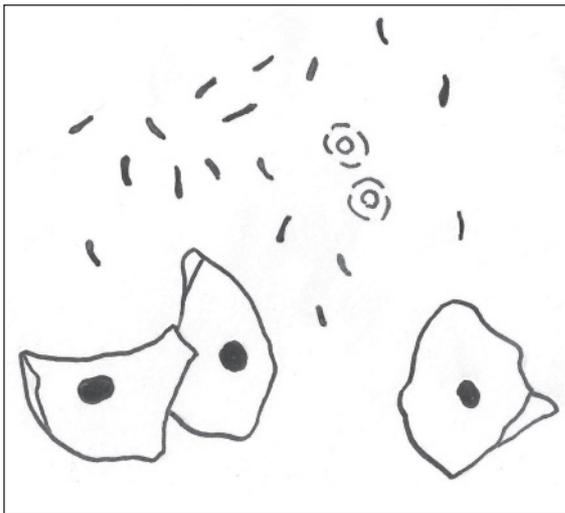


Figure 4 Normal wet mount

A good video clip on how to perform a wet mount is available for free at: http://www.glowm.com/?p=glowm.cml/video_player1&id=231&SESSID=1p31phnf9kr8sbepusdcjj5d6

Bimanual vaginal palpation

The technique of right-handed bimanual examination means that you assess the pelvic organs and any abnormal masses between your right hand placed internally in the vagina and your left hand placed externally on the lower abdomen of your patient.

It is best to do the bimanual palpation after your speculum examination as otherwise you contaminate your swabs. The patient should be in lithotomy or dorsal position as for the speculum examination and you should again explain what you are planning to do.

Here is a description on how to do a bimanual examination:

You can find a video clip as well at: <http://www.medicalvideos.us/play.php?vid=363>

Insert the gloved index and middle finger of your right hand in the vagina. Here as well you should avoid touching the external urethra orifice and introduce your fingers in the part of the vulva near the perineum. Use jelly or water to avoid friction. Place your left hand on the lower abdomen of the patient above the symphysis and gently palpate with your fingers.

It makes sense to assess each organ systematically in order not to forget anything. Here is a possible systematic approach:

Cervix

- *Excitation tenderness* Move the cervix gently to each side with one finger. Pain points at a tubo-ovarian mass (ectopic, abscess) or inflammation.
- *Consistency* A normal cervix is firm but not hard, in pregnancy the cervix is softer with a firmer core. In cervical cancer the cervix can be hard, broad, with an irregular surface.
- *Mobility* Put your left hand above the uterus and try to move the cervix against the uterus with your right hand. Immobility can point at cervical cancer.
- *External os* Open in multipara, miscarriage.

Uterus

- *Axis* You can assess whether a uterus is anteverted, straight or retroverted. If you can palpate the uterus between your two hands while index and middle finger of your right hand are in place in the anterior fornix (in front of the cervix), the uterus is anteverted (Figure 5). If you can palpate the uterus between your hands by placing the two fingers of your right hand in the posterior fornix (behind the cervix), the uterus is retroverted (Figure 6). The uterus can also be positioned straight (not ante- or retroverted). It is very important to determine the axis, especially if you need to insert an IUD or MVA later, to avoid perforation of the uterus.

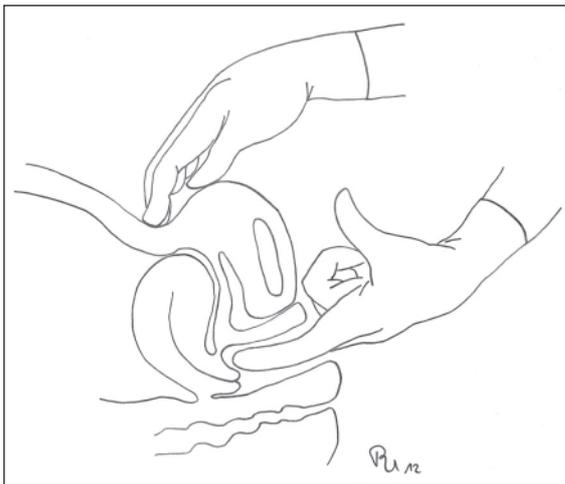


Figure 5 Bimanual palpation of an anteverted uterus

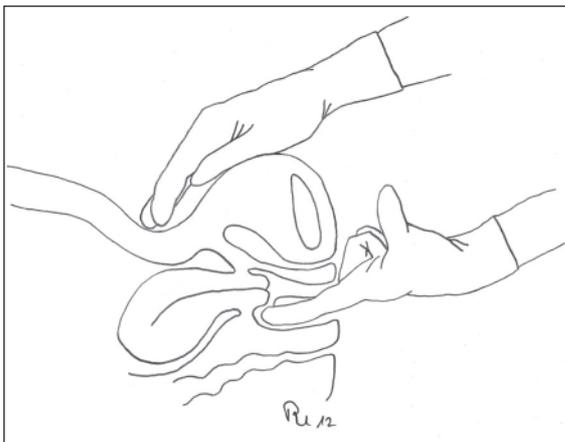


Figure 6 Bimanual palpation of a retroverted uterus

- *Size* Enlarged in pregnancy, due to uterine fibroids or malignancy, larger than gestational age in molar pregnancy.
- *Consistency* A gravid uterus is soft, uterine fibroids are hard or at least firm; advanced uterine or cervical malignancy is often hard but endometrium carcinoma can show itself as a soft enlarged uterus as well. A large tubo-ovarian mass can be mistaken for an enlarged uterus. You can differentiate the two by moving it and assess whether the cervix is moving at the same time or not.

Adnexa

You can assess the tubo-ovarian area by placing your fingers in the lateral vaginal fornices on the right and left side of the cervix and the fingers of your left hand on the right and left side of the mid-line above the symphysis.

- *Size* Normally sized ovaries are usually not palpable unless in very slim premenopausal patients. Then they have a diameter of about 2cm and are firm on palpation. An enlarged ovary in a postmenopausal patient needs further investigation. Normal tubes are not palpable either, not even in very slim patients. If you palpate a mass on the side of the uterus you cannot know whether the tube or the ovary is enlarged. It is called a tubo-ovarian mass. They can arise from ovarian cysts, solid benign tumors, ovarian malignancy, hydrosalpinx, ectopic pregnancy, tubo-ovarian abscess or rarely tubal malignancy.
- *Tenderness* Check for pain in the tubo-ovarian area as described above. This can point to adnexitis or pelvic inflammatory disease (PID) (most often bilateral), ectopic pregnancy (unilateral) or ovarian cysts or hydrosalpinx (uni- or bilateral).
- *Mobility* Remember that uterine masses move with the cervix and tubo-ovarian masses usually don't. Assess mobility of the mass against the cervix and by direct palpation in the lateral fornices. A tubo-ovarian abscess in frozen pelvis or PID is usually immobile; benign ovarian tumors such as a dermoid or ovarian cyst can be very mobile especially if they are so big that they are located outside the true bony pelvis as by then there are no constraints concerning space as inside the true pelvis.

Rectovaginal examination

The rectovaginal palpation is not necessary in every patient but in cases where you suspect malignancy, endometriosis or any process located in the pouch of Douglas. It helps to assess the structures between the vagina and rectum and the lower parts of the broad ligament, which stretches from both sides of the uterus to the pelvic bones. As this part of the examination is uncomfortable and embarrassing you should inform the patient about what you will do prior to this stage of the examination.

Leave your right index finger in the vagina and introduce your lubricated right middle finger in the patient's rectum. Keep your left hand on her abdomen above the symphysis. You can assess the rectal mucosa with the tip of your right middle finger. Feel for smoothness and regularity of the surface. A disruption of the surface, a tumor or an ulceration can be a malignancy or endometriosis penetrating the rectum from the pouch of Douglas.

By gently pressing your index and middle finger together you can assess the tissue between rectum and vagina. Induration or enlargement of this area can point to endometriosis or cervical/uterine or rectal malignancy.

Assess the broad ligaments by gently pushing your two internal fingers upwards against your palpating left hand. Palpate for induration or enlargement. This points to advanced stage cervical carcinoma or uterine malignancy.

Examination of the breast

As you have limited time available for each patient you should offer breast examination to all patients with a positive history of breast symptoms or a first-degree relative with breast cancer.

A breast palpation doesn't take much time. You can do it after you finished your gynecological examination. As the breast tissue reacts to different female hormones during the menstrual cycle it is important to know on which day of her cycle approximately your patient is when you do your examination. It is best to perform a breast palpation in the first week of the cycle as the hormone level is lowest and thus the breast tissue softest. Like this, small tumors are more easily differentiated from normal tissue or mastopathy a common benign finding in women of reproductive age. But do not omit a breast examination because your patient happens to be further in her cycle because this is a

missed opportunity to find bigger tumors or other pathology. Do the examination nevertheless and explain to her that it is best to repeat it in another cycle's first week.

Ask the patient to put on her clothes again down below and to undress from the waist upwards. The first part of the examination (inspection, assessment of the lymphatic system) is done in the upright position (either standing or sitting). For the second part (breast palpation) the patient should lie down on her back. There is a good video clip on how to do a breast examination at: www.medicalvideos.us/play.php?vid=373.

Inspection

Ask the patient to put her hands on her hips and to look straight ahead. Inspect both breasts for:

- *Symmetry* Big benign or malignant tumors will increase the size of the respective breast, or a patient may have had asymmetric breasts since puberty and she will tell you once you talk to her about your findings.
- *Location* Record the location of any finding according to the quadrant.
- *Visible tumors, with or without ulceration* Puerperal mastitis can develop into an abscess but keep in mind that a carcinoma can also develop or ulcerate during pregnancy or lactation. Tuberculosis can lead to abscesses in the breast. They usually present as multiple fistula-like abscesses and are more frequent in immunodeficiency like HIV.
- *Skin changes (redness, orange skin phenomenon)* These can either point to a puerperal/non-puerperal mastitis or an inflammatory carcinoma.
- *Skin retraction.*

Lymph node palpation

You should always palpate the following lymph node groups on both sides (Figure 7). It is best to establish a systematic approach in order not to miss out a region:

- Cervical
- Supraclavicular
- Infraclavicular
- Axillar
- Parasternal

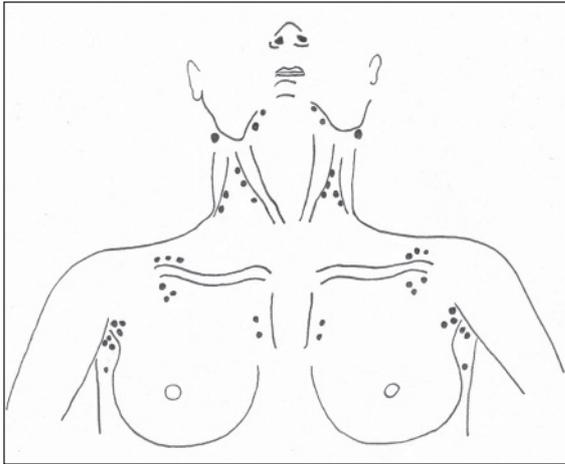


Figure 7 Lymph nodes for breast palpation

Palpate the above-mentioned regions with your index and middle fingers using the finger tips. Assess for:

- **Size** Normal lymph nodes are about 0.5–1 cm. Enlarged lymph nodes can be found in acute (flu, erysipelas of the hand) and chronic (HIV, tuberculosis) infection or malignancy (breast cancer, lymphoma). Keep in mind that many people have enlarged cervical lymph nodes and that lymphatic tissue can be reactively enlarged several weeks after an event, e.g. an infected wound on your finger.
- **Consistency** Normal or reactively enlarged lymph nodes are soft to elastic. Indurated lymph nodes are highly suspicious of malignancy or tuberculosis.
- **Mobility** Immobile lymph nodes, often fixed to each other, are found in malignancies.
- **Tenderness** Painful lymph nodes are mostly reactive to trauma or infection. Lymph node metastases are most of the time painless.

Breast palpation

Ask the patient to lie down on her back with both hands folded behind her head. Now inspect the breasts again. The change in position brings tumors lying deeper in the breast tissue nearer to the skin. Do you see any tumor or plateau? Now start to palpate each breast systematically with your fingertips as described for lymph node palpation. In order not to miss out any area always start with the right breast. Divide the breast in four parts and assess each of the following parts:

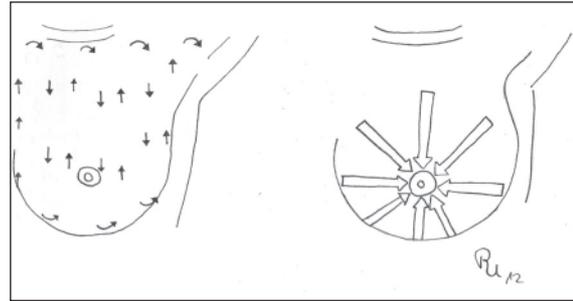


Figure 8 Breast palpation

- Upper outer quadrant (UOQ)
- Upper inner quadrant (UIQ)
- Lower outer quadrant (LOQ)
- Lower inner quadrant (LIQ)

either from cranial to caudal or concentric from the periphery to the center (Figure 8). Do this even if you have already found a suspect area during inspection. This process will help you not to overlook a second tumor because you're hooked with your first finding. Do not miss out the area going towards the axilla laterally and palpate up to the infraclavicular region cranially. Finish by palpating the areola and check for nipple discharge by milking out the areola and the nipple. As this is uncomfortable you should always alert the patient before doing this. Be ready to take a smear for cytological and microbiological investigation in case of secretion!

Then move on to the left breast and proceed as described.

Assess each palpable tumor for the following:

- **Location** Record the location of any finding according to the quadrant.
- **Size** Record the biggest diameter in centimeters.
- **Consistency** Is the tumor hard or softer, is the surface regular or irregular? Cysts are usually soft or elastic with a regular surface and well-differentiated limitations. Fibroadenoma are often hard or firm with well-differentiated limitations and a regular surface. Carcinoma can be hard or firm. Their surface is often irregular and their borders to adjacent breast tissue can be difficult to differentiate. This is because they grow into adjacent tissue and benign tumors only push aside normal tissue.
- **Mobility** Check mobility by taking the tumor between the index finger and the thumb and move it around. Check for mobility against the

skin and the pectoral muscle. Benign tumors such as fibroadenoma can be very mobile. Cancer is usually fixed or at least less mobile but keep in mind that well-differentiated cancer can be mobile as well.

- *Skin retraction* This shows infiltration of deeper skin levels by a carcinoma and is often only visible once you move the tumor between your fingers.
- *Skin rashes* Inflammatory carcinoma can present with redness or skin changes that resemble the skin of an orange. If you can palpate a tumor below such skin changes you have to think of carcinoma.

Note: the tumors most commonly overlooked are behind the nipple and at the lower breast fold.

Ultrasound

This section will give you a brief introduction to different sonographic methods. A more in-depth description is outside the scope of this book. Interested readers can find some recommendations on books in the Further reading section of this chapter.

Technical background

Ultrasound can show the internal organs through sonic waves. You can perform abdominal, vaginal or breast ultrasound depending on the transducer or probe your machine has. Usually an ultrasound machine comes with several probes which can be changed according to your needs:

- 3.5 megahertz (MHz which is the frequency of the sonic waves the probe uses) for abdominal ultrasound
- 7.5 MHz for vaginal ultrasound
- Linear probe with 5 MHz for breast ultrasound

It is difficult to learn how to perform ultrasound on your own, but if you have a colleague who is already trained you can learn from him or her. Otherwise it is better to take a training course if there is a machine in your hospital but no skilled sonographer as there are pre-settings to be made to adjust the probe to each patient and condition (e.g. depth, focus, zoom, sector angle) and this is difficult to learn on your own. Ultrasound is a very safe method even in early pregnancy with no exposure to radiation.

Most gynecological and early pregnancy assessments are done with the vaginal probe as the pelvic organs are best visualized. The probe is long and

thinner than the other probes and is introduced in the vagina, which can be a very awkward situation for your patient and yourself as this resembles to some extent sexual intercourse. For a male examiner it is therefore better to have a chaperone in the room as mentioned above, but also a female provider should always talk to the patient beforehand and explain why it is important to use that probe and that usually it doesn't hurt. As with bimanual palpation a vaginal ultrasound should not be performed in virgin patients. Here an abdominal ultrasound or a rectal ultrasound (introduction of the vaginal probe rectally) should be done instead.

Note, it is important that, for vaginal ultrasound, your patient's bladder is empty, while, for abdominal ultrasound of pelvic organs, the bladder should be full in order to better visualize the uterus and other structures against the pubic bone and the bowel. If you think you may need to do both examinations, start with the abdominal ultrasound and send your patient for voiding in between. The advantage of using the abdominal probe is that at the same time you evaluate the pelvic organs you may scan the kidneys, liver and spleen, the abdominal wall and look for free fluid under the diaphragm. You can also identify masses related to the pelvic organs, but which lie outside the bony pelvis due to their size, e.g. a large ovarian tumor or a pendulant fibroid. The disadvantage of using the abdominal probe in gynecology is that you have less access to the structures lying inside the bony pelvis, e.g. normal ovaries.

Indications

- *Early pregnancy assessment* Gestational age, location, number of fetuses, viability, completeness of abortion and necessity for further treatment.
- *Postmenopausal bleeding and menstrual disorders* Endometrial thickness, endometrial polyps, fibroids, adenomyosis.
- *Pelvic pain* Ovarian cysts, tubo-ovarian abscess, hydro-/pyosalpinx, adnexal torsion, endometriosis, adenomyosis.
- *Subfertility and contraception* Congenital malformations, hydro-/pyosalpinx, polycystic ovaries, endometriosis, follicle development, endometrial thickness/lining, assessment of the uterine cavity, location of IUD.
- *Gynecological tumors* Ovarian masses, ascites, staging, uterine fibroids, endometrial thickness,

trophoblastic disease, liver metastasis, pleural effusions for tapping.

- *Urogynecology* Residual bladder volume, bladder neck angle.
- *Breast tumors* Differential diagnosis (cysts, solid tumors, mastopathy, abscess), lymph node assessment, cytology under ultrasound guidance.

Technique

You need to apply ultrasound jelly for all your examinations otherwise you will fail to see well. The availability of this jelly is a precondition for ultrasound and implicit in the method. For abdominal and breast ultrasound put a sufficiently large amount of jelly on the site you want to scan. For vaginal ultrasound put jelly in a condom before covering the probe with it and a bit on the outside of the condom after covering the probe. This will ease introduction into the patient's vagina.

During the scan, all organs or structures should be assessed in two planes: the horizontal and the vertical axis. This will give you an idea of the extent of the process and get you as close as possible to a three-dimensional picture of the structure.

Examine all important structures for the following criteria:

- Margins or capsule of the process (ill-defined, well-defined, with or without external growth)
- Size, measured in three planes (width, depth and length) in mm
- Internal echo and content (internal papillary growth yes or no)
- Posterior enhancement or shadowing
- *Echo pattern of the tissue* This is called echogenicity and is defined relative to the sonographic appearance of fat tissue. Findings with isoechogenic pattern have the same sonographic appearance as fat; hyperechogenic means increased echogenicity (more whitish), hypoechogenic means decreased echogenicity (darker than fat) and a structure with an anechogenic sonographic pattern displays no internal echoes. Fluids like ascites or contents of ovarian cysts are anechogenic. Blood may be anechogenic if it is fresh. Clots are often hypo- or hyperechogenic.

You should establish a systematic standard order of examination. This prevents you from missing out on the examination of one organ or structure because you are hooked with another one.

This will also help the documentation of your findings especially when you take a standard set of pictures if your machine allows you to do so. By documenting your findings this way and by noting the measurements of organs/structures and the above-mentioned criteria you can always compare with your actual findings when you see your patient again. In case the next examiner is not you for any reason, your colleague will appreciate this information.

In Box 1 you will find an example on how to document ultrasound findings which you can use by either photocopying it or drawing your own sketch.

Transabdominal ultrasound

Transabdominal ultrasound (TA) is done in a supine position, for gynecological assessment with a full bladder. Start with the pelvic organs. Identify the uterus behind the bladder in the longitudinal axis. Assess the uterine length and endometrial thickness (see Chapters 9 and 10). Take a transverse section and assess uterine width and depth and locate the ovaries. Assess their size in three dimensions by transverse and longitudinal sections. In more obese patients, ovaries may be difficult to visualize through TA.

Look for abnormal masses in the lower abdomen. Note that you can almost exclude an ovarian origin of an abdominal mass by demonstrating two normal ovaries. TA is useful for evaluating abdominal masses which lie outside the bony pelvis as these cannot be visualized by transvaginal scan. A severely enlarged uterus can also only be assessed and measured through abdominal ultrasound.

If indicated look for free fluid under the diaphragm (anechogenic echo pattern), assess both kidneys (e.g. dilatation of the ureter or the renal pelvis, enlargement), the liver (enlargement, metastasis) and the spleen. Assess the bladder wall for internal growth, especially in an area where schistosomiasis is endemic, since schistosomiasis causes bladder cancer.

Transvaginal ultrasound

Transvaginal ultrasound (TVS) is done in a supine position with the patient either putting her fists under her buttocks or holding her legs with the knees bent as described for speculum examination. Alternatively you can use a pillow which you put under the patient's buttocks. This is important in

order to introduce the probe and visualize the pelvic organs without hurting your patient.

As the same probe is used for all patients you have to make sure always to cover it with a condom before you introduce it into a patient's vagina, discard the condom after use and clean the probe with disinfectant. The patient's bladder must be empty. As mentioned above, a TVS can be very difficult and embarrassing for the patient so it is very important to create an atmosphere of respect, safety and privacy. The door should be lockable as for pelvic examination and if possible a chaperone should be present for male sonographers. When appropriate in your setting, cover the patient's pelvic area with a towel or her skirt or dress so that she may feel less exposed. The patient's pelvic muscles have to be relaxed in order to perform a painless TVS, so you need to do everything to make her feel at ease and safe.

Always explain to the patient what you are about to do, especially concerning the vaginal introduction of the probe.

TVS is the gold standard for assessing pelvic organs but it needs a bit more experience than TA to get used to the sonographic view of the field. It may be useful to imagine the beams of the vaginal probe as the light beams of a torch which has to be rotated and angled to visualize the structures on the sides.

As with other parts of the gynecological examination you should have a structured approach which will facilitate documentation as well. Always start the scan with the uterus, proceed to the ovary on one side, then the other, then proceed to abnormal findings around the organs.

Gently introduce the probe and identify the uterus through a longitudinal section which is easiest. Take a transverse section and angle your probe to identify the ovary on one side. You can use the internal iliac artery as a landmark (a rather big round or long anechogenic structure, or colored if you use Doppler with visible pulsations). The ovary should be visible in the area of this vessel.

Uterus Assess, lie, position (ante- or retroverted) and length. Length varies with age and parity. A normal nulliparous uterus is around 60 mm long, but a uterine length of 80–90 mm in a multipara can still be considered as normal (Figure 9).

Note the thickness of the endometrium (varies during cycle in premenopausal women and should be less than 4 mm in postmenopausal women), its

echogenicity (iso- or hyperechogenic, triple line etc.) and the echogenicity of the uterine wall. Look for a gestational sac in the fundal part of the endometrial line. Check for uterine fibroids which are hypo- or isoechogenic or hyperechogenic isles of adenomyosis, especially in the posterior wall of the uterus. Take pictures of a longitudinal section and of any abnormality.

Ovaries Measure the size. Look for cysts and measure their size (<30 mm in premenopausal women is normal). Look for the small pearl-string-like follicles of polycystic ovaries (PCO). Normal tubes cannot be demonstrated sonographically. So any cystic structures in the surroundings of normal ovaries are probably related to abnormal tubes, e.g. ectopic pregnancy, hydro-/pyosalpinx. Take pictures of the normal ovaries in two planes and of any abnormality (Figure 10).

Tubo-ovarian masses can be very hard to evaluate (see Chapter 5) and depending on the age of your patient can have a significant risk of malignancy. In order to better assess for potential

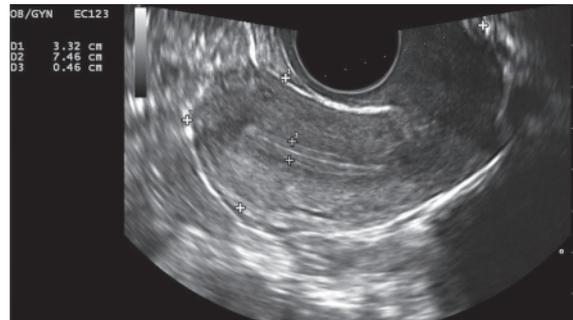


Figure 9 Normal uterus in vaginal ultrasound (Courtesy David van Ham)

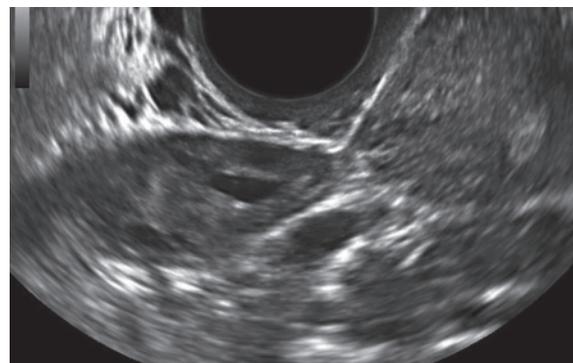


Figure 10 Normal ovary in vaginal ultrasound (Courtesy David van Ham)

malignancy, various sonographic risk indices have been established and validated. Currently the one that is best validated and researched is the risk of malignancy index (described in Chapter 11).

Free fluid Look in pouch of Douglas for free fluid (usually dark) or blood clots (in case of ectopic pregnancy).

Bladder Look at the lining of the bladder. You may see papillary formations that may be polyps or bladder cancer.

Saline contrast hysterosonography

Saline contrast hysterosonography (SCH) or saline infusion sonography (SIS) is an additional means to better assess the uterine cavity for example in cases of pre- and postmenopausal bleeding, infertility or submucous fibroids. In high-resource settings the gold standard is a hysteroscopy combined with endometrial sampling. However, in many resource-poor settings, hysteroscopy is not available. Evidence from meta-analysis shows however that SCH combined with endometrial sampling in selected cases gives adequate results that support its use as a more cost-effective alternative¹. Sensitivity and specificity found were 95% and 88%, respectively. The results were slightly better for pre- than for postmenopausal women, and lower for small endometrial polyps. The likelihood of detecting uterine malignancy is higher in the postmenopausal patient when combined with endometrial sampling, e.g. with the smallest MVA cannula as described in Chapter 9. Because 7% of malignancies are missed with this method, the importance of concomitant endometrial sampling in postmenopausal patients should be emphasized. SCH is best done in the postmenstrual period but uterine bleeding is not a contraindication.

A normal endometrium shows a regular surface with even thickness in all parts and a clear border to the myometrium. Endometrial polyps often have pedicles with vascularization. They have a smooth, regular surface and may show hypo- to anechoic regular patches. Their main differential diagnosis is thick endometrium. Endometrial adenocarcinoma may look like thick endometrium or a polyp but often shows an irregular form and surface, mixed echogenicity and non-distinct borders between myometrium and endometrial layer. In uterine fibroids, SCH helps to assess the

thickness of remaining myometrium below the fibroid and the size of its intramural part

Here is a description how to carry out a SCH

The procedure doesn't need any anesthesia. For the best results, however, your patient should be relaxed and co-operative. So, explain to her what you are going to do. Prepare a syringe with 10–20 ml of sterile normal saline and a sterile neonatal feeding tube. Ask the patient to empty her bladder and put her in a lithotomy position or on her back as described for the speculum examination. Insert a self-holding speculum as described above, disinfect with iodine and insert the feeding tube with a sponge-holding forceps bit by bit through the cervical os into the uterine cavity. If you have problems doing so, put a tenaculum on her anterior cervix while asking her to cough. With this you will be able to move the uterus in the direction you need it to insert the tube. Start a vaginal ultrasound to visualize the end of the tube above the inner os of the cervix. Insert the normal saline into the uterine cavity via the feeding tube and perform ultrasound during the infusion of saline. The uterine cavity will distend through the saline and its walls and contents other than saline can be better explored, e.g. fibroids or polyps (Figure 11).

Indications for SCH are as for vaginal ultrasound where the uterine cavity cannot be explored properly:

- Abnormal uterine bleeding with thickened endometrium
- Infertility with suspicion of adhesions, submucous fibroids or polyps, anatomical anomalies of the uterus
- Increased endometrial layer in vaginal ultrasound

Contraindications are:

- Genital infections
- Pregnancy

There is a discussion but no evidence, that the use of liquids in the uterine cavity can facilitate peritoneal distribution of cancer cells in endometrial cancer.

Breast ultrasound

Breast ultrasound is done in a supine position with the patient's arms raised and bent behind the neck.

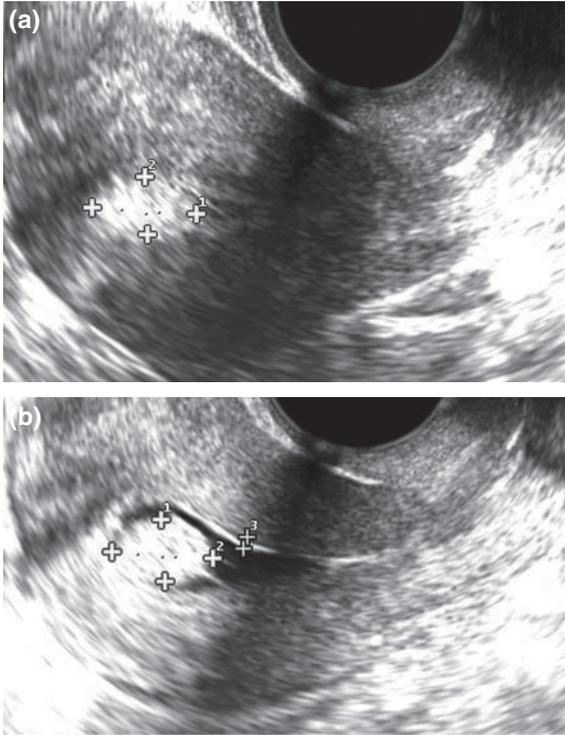


Figure 11 Polyp before (a) and during (b) SCH
(Courtesy Heleen van Beekhuizen)

It may sometimes be necessary to ask her to lie a bit sideways in order to better assess a structure near to the chest wall. As for the clinical breast examination ultrasound is best done in the first half of the menstrual cycle before ovulation.

Make sure you use an adequate amount of ultrasound jelly. Otherwise the soft structures of the breast tissue will be difficult to evaluate. In order not to miss out any lesion you should have a standardized way of performing your ultrasound: always start out with the right axilla (even if you have palpated a big tumor in the left breast). Proceed to the right breast, then the left axilla and last the left breast. Breast ultrasound needs a lot of experience as you can produce a lot of artefacts by pressure with the probe alone. Remember, that you should be able to demonstrate a finding in two different planes (by holding the probe in the vertical AND horizontal position) to exclude an artefact.

Scan the axilla with the probe horizontally from downwards to upwards and then with a vertical probe from medial to lateral. You will see the axillary blood vessels as anechogenic, round or longitudinal structures. If your machine has a Doppler

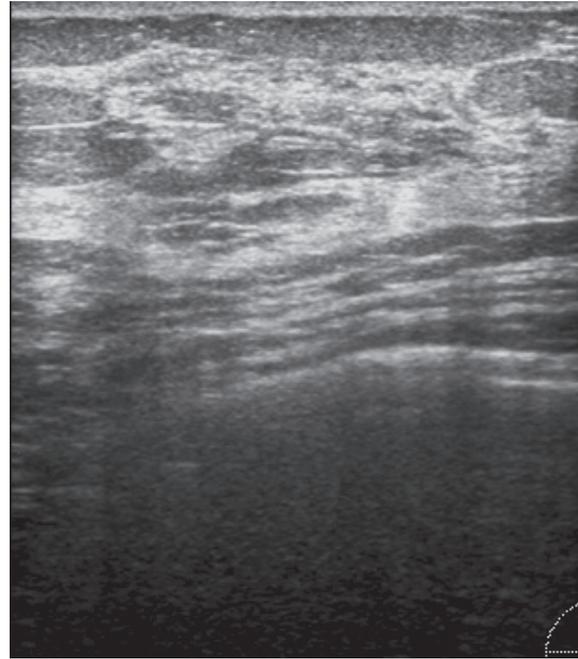


Figure 12 Normal breast tissue on ultrasound

function it is easy to identify a blood vessel through its color. There are always lymph nodes visible in the axilla. Usually they have a clear margin with a clear demarcation to the surrounding tissue and show a hypoechogenic internal echo. Normally they have only one artery running towards them.

Scan the breast either running radially from the periphery to the nipple or in windings from the UOQ to the LIQ as described for the clinical examination.

Normal breast tissue consists of fat and fibroglandular tissue. The latter looks like a leopard's fur on ultrasound (Figure 12).

The American College of Radiology has developed a documentation and reporting system called BI-RADS (Breast Imaging Reporting and Data System) which has been internationally recognized (Table 1). We will present it here but you can also find it at: http://www.acr.org/SecondaryMainMenuCategories/quality_safety/BIRADSAtlas/BIRADSAtlasexcerptedtext/BIRADSUltrasoundFirstEdition/ACRBIRADUSUSLexiconClassificationFormDoc1.aspx.

A mass is defined as a space-occupying lesion which can be seen in two different projections². All other lesions are mostly artefacts. This mass should be evaluated considering:

Table 1 BI-RADS® classification (American College of Radiology, ACR)

Category	Description
0 Incomplete	Additional imaging needed before final assessment
1 Negative	No lesion found (routine follow-up)
2 Benign finding	No malignant features (e.g. cyst, routine follow-up)
3 Probably benign finding	Malignancy is highly unlikely (e.g. fibroadenoma, initial short interval follow-up)
4 Suspicious abnormality	Low to moderate probability of cancer, biopsy should be considered
5 Highly suggestive of malignancy	Almost certainly cancer, appropriate action should be taken
6 Known cancer	Biopsy-proven malignancy

- *Shape* A regular shape, oval or round is suggestive for benign masses, irregular shape may point to malignancy.
- *Orientation* If the long axis of the lesion runs parallel to the skin, i.e. horizontal, the lesion aligns itself with the surrounding tissue, which is a sign for a benign process, a vertical lesion is more likely to be invasive.
- *Margin* The margin of a benign lesion is more likely to be well defined or sharp. The demarcation to the surrounding tissue is clear. Malignant lesions are more likely to have indistinct margins or are microlobulated.
- *Lesion boundary* The demarcation of the boundary between a benign lesion and the surrounding tissue is sharp or shows a well-defined echogenic rim, like a capsule. Malignant lesions are less well defined and demarcated from surrounding tissue.
- *Echo pattern* An anechogenic pattern points to a cyst; complex lesions with both anechogenic and echogenic pattern are more likely to be malignant. Hypo- or hyperechogenic lesions can be malignant or benign.
- *Posterior acoustic features* This refers to shadowing or enhancement posterior of the lesion. Malignant lesions often have decreased posterior echoes.
- *Surrounding tissue* As malignant tumors invade the surrounding tissue and distort anatomy it is

important to inspect the structures near the lesion. Look for thickening of the skin, skin retraction, edema and abnormal calibration of ducts or disruption of normal anatomical planes and thickening or straightening of Cooper’s ligaments (fibrous ligaments separating the lobuli of the breast tissue).

- *Calcifications* Calcifications are hardly visible on ultrasound unless inside a mass.
- *Vascularity* If your machine has a Doppler function you can use it to demonstrate vascularization of the lesion. Increased vascularization is suspicious for malignancy.

Please note that no single criterion proves malignancy. Even if it is most likely malignancy you need to take a specimen for cytology/histology as described in Chapter 30.

Positive findings in one or the other criterion above will lead to a categorization according to Table 1.

Document your findings in writing and if possible with photos in order to allow reassessment at a different occasion or adequate surgical removal of the lesion in question. An example on how to design a breast ultrasound form is given in Box 2.

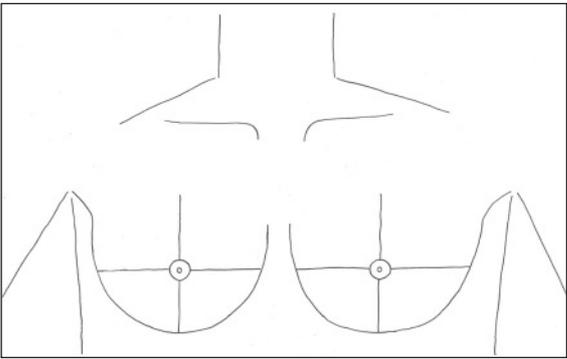
Laboratory investigations

There might be routine investigation standards set up in your laboratory for certain conditions or likely operations. Please use them wisely!

Indications

- Hb to assess the level of anemia
- Erythrocyte sedimentation rate (ESR) or white blood count (WBC) to know if there is infection. Be aware however that big fibroids can be necrotic without symptoms which will raise the ESR and maybe even the WBC. Pregnancy will raise the ESR as well.
- Blood grouping and cross-matching for operation or to give blood transfusion to correct anemia prior to operation.
- Urinalysis to detect UTI as a source of post-operative infection prior to operation.
- Urea and creatinine may be high in advanced cervical cancer since the ureter(s) can be blocked.
- Urine pregnancy test (UPT) is in many settings available in limited numbers: use only for valid indications!

Box 2 Example of documentation for an breast ultrasound examination

Breast Ultrasound Documentation								
Name of your hospital								
Patient Name:						Age:		
LMP:								
Symptoms:								
Request for sonographer:								
Lymph nodes								
<i>Right:</i>			NAD			Suspicious		
<i>Left:</i>			NAD			Suspicious		
Supraclavicular	<input type="checkbox"/>		<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>
Axillar	<input type="checkbox"/>		<input type="checkbox"/>			<input type="checkbox"/>		<input type="checkbox"/>
Breast								
Localization	Size (mm ³)	Shape	Orientation	Margin	Echo pattern	Posterior acoustic features	Vascularity	BI-RADS
		Oval <input type="checkbox"/> Round <input type="checkbox"/> Irregular <input type="checkbox"/>	Horizontal <input type="checkbox"/> Vertical <input type="checkbox"/>	Sharp <input type="checkbox"/> Indistinct <input type="checkbox"/>	Hypoechogenic <input type="checkbox"/> Hyperechogenic <input type="checkbox"/> Anechogenic <input type="checkbox"/>	No features <input type="checkbox"/> Enhancement <input type="checkbox"/> Shadowing <input type="checkbox"/>	None <input type="checkbox"/> In lesion <input type="checkbox"/> Adjacent <input type="checkbox"/>	
		Oval <input type="checkbox"/> Round <input type="checkbox"/> Irregular <input type="checkbox"/>	Horizontal <input type="checkbox"/> Vertical <input type="checkbox"/>	Sharp <input type="checkbox"/> Indistinct <input type="checkbox"/>	Hypoechogenic <input type="checkbox"/> Hyperechogenic <input type="checkbox"/> Anechogenic <input type="checkbox"/>	No features <input type="checkbox"/> Enhancement <input type="checkbox"/> Shadowing <input type="checkbox"/>	None <input type="checkbox"/> In lesion <input type="checkbox"/> Adjacent <input type="checkbox"/>	
		Oval <input type="checkbox"/> Round <input type="checkbox"/> Irregular <input type="checkbox"/>	Horizontal <input type="checkbox"/> Vertical <input type="checkbox"/>	Sharp <input type="checkbox"/> Indistinct <input type="checkbox"/>	Hypoechogenic <input type="checkbox"/> Hyperechogenic <input type="checkbox"/> Anechogenic <input type="checkbox"/>	No features <input type="checkbox"/> Enhancement <input type="checkbox"/> Shadowing <input type="checkbox"/>	None <input type="checkbox"/> In lesion <input type="checkbox"/> Adjacent <input type="checkbox"/>	
		Oval <input type="checkbox"/> Round <input type="checkbox"/> Irregular <input type="checkbox"/>	Horizontal <input type="checkbox"/> Vertical <input type="checkbox"/>	Sharp <input type="checkbox"/> Indistinct <input type="checkbox"/>	Hypoechogenic <input type="checkbox"/> Hyperechogenic <input type="checkbox"/> Anechogenic <input type="checkbox"/>	No features <input type="checkbox"/> Enhancement <input type="checkbox"/> Shadowing <input type="checkbox"/>	None <input type="checkbox"/> In lesion <input type="checkbox"/> Adjacent <input type="checkbox"/>	
		Oval <input type="checkbox"/> Round <input type="checkbox"/> Irregular <input type="checkbox"/>	Horizontal <input type="checkbox"/> Vertical <input type="checkbox"/>	Sharp <input type="checkbox"/> Indistinct <input type="checkbox"/>	Hypoechogenic <input type="checkbox"/> Hyperechogenic <input type="checkbox"/> Anechogenic <input type="checkbox"/>	No features <input type="checkbox"/> Enhancement <input type="checkbox"/> Shadowing <input type="checkbox"/>	None <input type="checkbox"/> In lesion <input type="checkbox"/> Adjacent <input type="checkbox"/>	
								
Diagnosis:								

FURTHER INVESTIGATIONS

Colposcopy and direct visual inspection

See Chapter 26 on how to do a colposcopy and VIA/VILI.

Hysterosalpingography

See Chapter 16 on how to do and read a hysterosalpingography.

Intravenous pyelography

If you suspect obstruction of the ureter (e.g. you saw hydronephrosis on ultrasound of the kidneys), e.g. in massive fibroids, endometriosis and cervical cancer you may do an intravenous pyelograph pre-operatively for fibroids and endometriosis to locate the level of obstruction and for staging purposes in cervical cancer (see Chapter 26). If you have a radiographer in your hospital he will be able to do this investigation for you.

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Further reading

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