while a good result may mimic a normal breast closely, there will inevitably be scars and loss of sensation. The reconstructed breast cannot be exactly like the original.

The first step is to form a structure called a breast mound. This can be accomplished using artificial materials called **breast implants**, or by using tissues from other parts of the woman's body. The second step involves creating a balance between the newly constructed breast and the breast on the opposite side. The nipple and areolar complex (darker area around the nipple) are recreated. This is usually done several months after the mound is created, to allow swelling to go down. Other procedures may be necessary, such as lifting the opposite breast (mastopexy), or making it larger or smaller to match the reconstructed breast.

Timing, immediate or delayed reconstruction

While immediate reconstruction (IR) is not recommended for women with breast cancer who need to undergo other, more important treatments, breast reconstruction can be done almost anytime. It even can be done during the same procedure as the **mastectomy**, or it can be delayed. There are psychological benefits to IR. The ability to return to normal activities and routines is often enhanced when reconstruction follows immediately after mastectomy. A better appearance may result from IR. There is less skin removal, often resulting in a shorter scar. The surgeon is better able to preserve the normal boundaries of the breast, so it is easier to match the opposite breast more closely.

The cost of IR is generally lower than the cost of delayed reconstruction (DR). There is one fewer operation and hospital stay. Surgeon's fees may be lower for a combined procedure than for two separate surgeries.

There are disadvantages of IR as well. The surgery itself is longer, causing more time under anesthesia. Post-operative **pain** and recovery time will be greater than for mastectomy alone.

Other authorities contend that delayed reconstruction (DR) offers different physical and psychological advantages. The initial mastectomy procedure alone takes less time, and has a shorter recovery period and less pain than mastectomy and IR. The patient has more time to adjust to her diagnosis and recover from additional therapy. She is better able to research her options, and to formulate realistic goals for reconstruction. Some reconstructive surgery requires blood transfusions. With DR, the patient can donate her own blood ahead of time (autologous **transfusion**), and/or arrange to have family and friends donate blood for her use (directed donation).

The psychological **stress** of living without a breast is a disadvantage of DR. The extra procedure DR entails results in higher costs. Although initial recovery is faster, an additional recuperation period is required after the delayed operation.

Type of reconstruction

There are two basic choices for breast reconstruction. The breast tissue can be replaced with an implant or the breast is created using some of the woman's own tissues (autologous reconstruction).

ARTIFICIAL IMPLANTS. In general, implant procedures take less time, and are less expensive than autologous ones. Implants are breast shaped pouches. They are made of silicone outer shells, which may be smooth or textured. The inside may contain silicone gel, saline (salt water), or a combination of both.

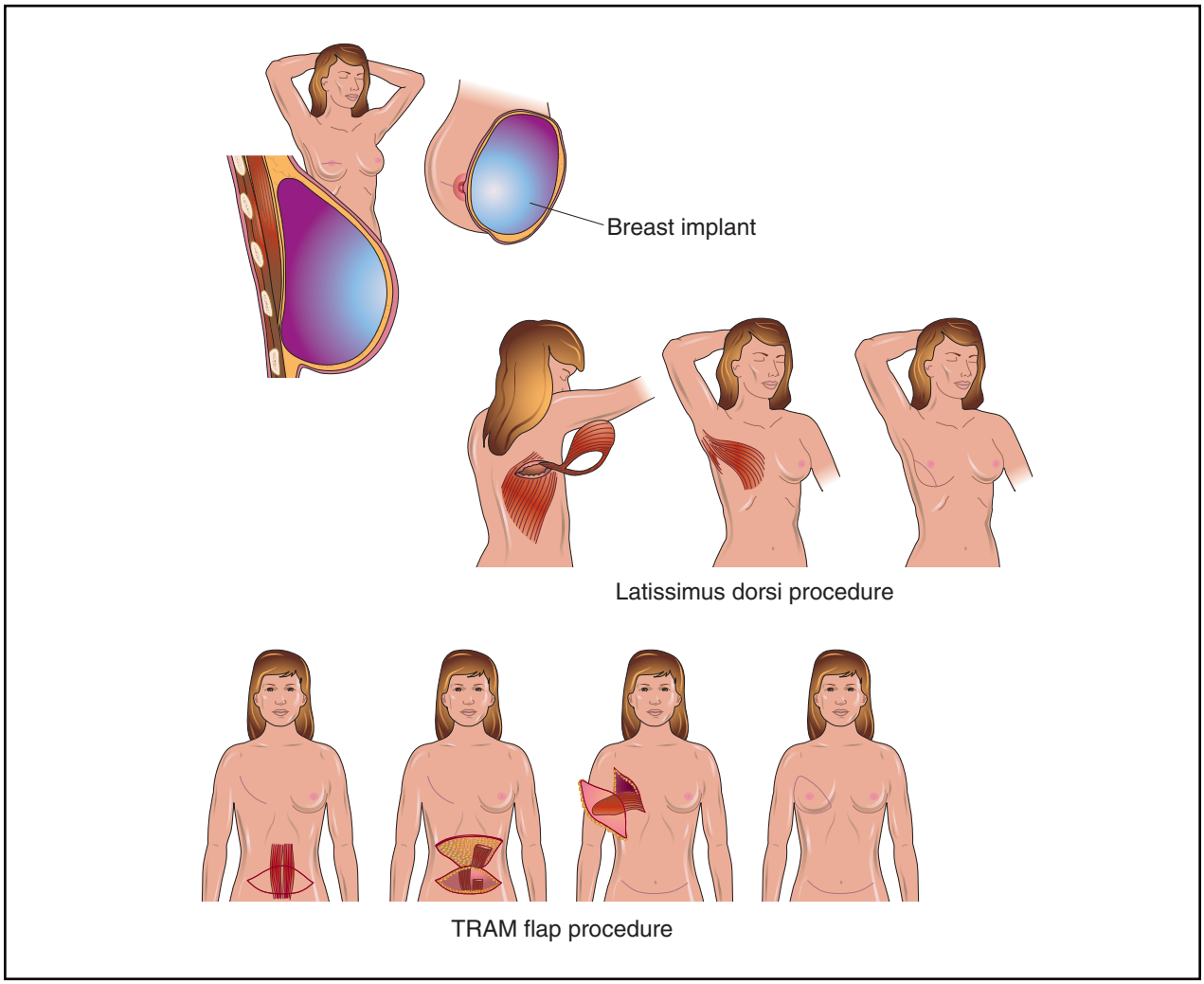
An implant may be a fixed volume type, which cannot change its size. Implants that have the capacity to be filled after insertion are called tissue expanders. These may be temporary or permanent.

The initial procedure for any implant insertion uses the mastectomy incision to make a pocket of tissue, usually underneath the chest wall muscle. In DR, the mastectomy scar may be re opened and used for this purpose, or a more cosmetic incision may be made. The implant is inserted into the pocket, the skin is stretched as needed and stitched closed.

If there is inadequate tissue to achieve the desired size, or a naturally sagging breast is desired, a tissue expander is used. It resembles a partially deflated balloon, with an attached valve or port through which saline can be injected. After the initial surgical incision is healed, the woman returns to the doctor's office, on a weekly or bi-weekly basis, to have small amounts of saline injected. Injections can continue for about six to eight weeks, until the preferred size is obtained. In some cases it may be overfilled, and later partially deflated to allow for a more pliable, natural result. A temporary tissue expander will be removed after several months and replaced with a permanent implant.

IR surgery using an implant takes approximately two to three hours, and usually requires up to a three day hospital stay. Implant insertion surgery, as part of DR, takes one to two hours and can sometimes be done as an outpatient, or it or it may entail overnight hospitalization.

AUTOLOGUS RECONSTRUCTION. Attached flap and free flap are two types of surgery where a woman's tissue is used in reconstruction. An attached flap uses skin, muscle, and fat, leaving blood vessels attached to their original source of blood. The flap is maneuvered to the reconstruction site, keeping its original blood supply for nourishment. This may also be known as a pedicle flap. The second kind of surgery is called a free flap. This also uses skin, muscle, and fat, but severs the blood vessels, and



Breast reconstruction surgery may be performed by inserting an artificial substance, or implant, to replace breast tissue. Autologous reconstruction, in which a woman's own tissues are used, includes the latissimus dorsi flap, where skin and muscle taken from the back is rotated around to the breast area, and the TRAM flap, in which abdominal fat and muscle are tunneled under the skin to the breast area. *(Illustration by Electronic Illustrators Group.)*

attaches them to other vessels where the new breast is to be created. The surgeon uses a microscope to accomplish this delicate task of sewing blood vessels together. Sometimes the term microsurgery is used to refer to free flap procedures. Either type of surgery may also be called a myocutaneous flap, referring to the skin and muscle used.

The skin and muscle used in autologous reconstruction can come from one of several possible places on the body, including the abdomen (TRAM flap or "tummy tuck"), the back (latissimus dorsi flap), or the buttocks (gluteus maximus free flap).

Finishing the reconstruction

Other procedures may be necessary to achieve the goal of symmetrical breasts. It may be necessary to make the opposite breast larger (augmentation), smaller (reduction), or higher (mastopexy). These, or any other refinements should be completed before the creation of a nipple and areola. Tissue to form the new nipple may come from the reconstructed breast itself, the opposite breast, or a more distant donor site, such as the inner thigh or behind the ear. The nipple and areolar construction is usually an outpatient procedure. A final step, often done in the doctor's office, is tattooing the new nipple and areola, to match the color of the opposite nipple and areola as closely as possible.

Insurance

Insurance coverage for breast reconstruction varies widely. Some policies will allow procedures on the affected breast, but refuse to pay for alterations to the opposite

breast. Other plans may cover the cost of an external prosthesis, or reconstructive surgery, but not both. As of January 1998, 25 states had different laws regarding required insurance coverage for post mastectomy reconstruction.

Implants may pose additional insurance concerns. Some companies will withdraw coverage for women with implants, or add a disclaimer for future implant-related problems. Careful reading of insurance policies, including checking on the need for pre-approval and/or a second opinion, is strongly recommended.

Preparation

Routine preoperative preparations, such as taking nothing to eat or drink the night before surgery are needed for reconstructive procedures. Blood transfusions are often necessary for autologous reconstructive surgeries. The patient may donate her own blood, and/or have family and friends donate several weeks before the surgery.

Emotional preparation is also important. Breast reconstruction will not resolve a psychological problem the woman had before mastectomy, nor make an unstable relationship strong. An expectation of physical perfection is unrealistic. A woman who cites any of these reasons for reconstruction shows that she has not been adequately informed or prepared. Complete understanding of the benefits and limitations of this surgery is necessary for a satisfactory result.

Aftercare

The length of the hospital stay, recovery period, and frequency of visits to the doctor after surgery varies considerably with the different kinds of reconstruction. In general, autologous procedures require longer hospitalization and recovery time than implant procedures. Bandages and drainage tubes remain in place for at least a day for all surgeries. Microsurgical or free flaps are most closely monitored in the first day or two after surgery. The circulation to the breast may be checked as often as every hour. Complete breast reconstruction requires at least one additional surgery to create a nipple and areola. Scars may remain red and raised for a month or longer. The true, final appearance of the breasts will not be visible for at least one year.

Risks

Some women have reported various types of autoimmune related connective-tissue disorders, which they attribute to their implants usually involving silicone gel implants. Lawsuits have been filed against the manufacturers of implants. Food and Drug Administration guidelines, issued in 1992, now limit their use to women who need to replace an existing silicone gel-filled implant, have had surgery for breast cancer, or have a medical condition which results in serious breast abnormality. In addition, patients must sign a consent form which details the potential risks of silicone gel-filled implants, and become enrolled in a long range study. Saline filled implants are permitted for all uses, although manufacturers must collect data on possible risks.

The FDA issued a status report on Breast Implant Safety in 1995, and revised it in March 1997. It noted that studies so far have not shown a serious increase in the risk of recognized autoimmune diseases in women with silicone gel-filled breast implants. It also addressed concerns about other complications and emphasized the need for further study of this issue.

There are a number of risks common to any surgical procedure such as bleeding, infection, anesthesia reaction, or unexpected scarring. Hematoma (accumulation of blood at the surgical site), or seroma (collection of fluid at the surgical site) can delay healing if not drained. Any breast reconstruction also poses a risk of asymmetry and/or the need for unplanned surgical revision. Persistent pain is another potential complication possible with all types of breast reconstruction.

Implants have some unique problems that may develop. A thick scar, also called a capsule, forms around

KEY TERMS

Autologous—From the same person. An autologous breast reconstruction uses the woman's own tissues. An autologous blood transfusion is blood removed then transfused back to the same person at a later time.

Capsular contracture—Thick scar tissue around a breast implant, which may tighten and cause discomfort and/or firmness.

Flap—A section of tissue moved from one area of the body to another.

Free flap—A section of tissue detached from its blood supply, moved to another part of the body, and reattached by microsurgery to a new blood supply.

Mastopexy—Surgical procedure to lift up a breast. May be used on opposite breast to achieve symmetrical appearance with a reconstructed breast.

Pedicle flap—Also called an attached flap. A section of tissue, with its blood supply intact, which is maneuvered to another part of the body.

the implant, as part of the body's normal reaction to a foreign substance. Capsular contracture occurs when the scar becomes firm or hardened. This may cause pain and/or change the texture and appearance of the breast. Implants can rupture and leak, deflate, or become displaced. The chances of capsular contracture or rupture increase with the age of the implant. These complications can usually be remedied with outpatient surgery to loosen the capsule or remove and/or replace the implant as needed. There is some evidence that using implants with textured surfaces may decrease the incidence of these problems. An implant tends to remain firm indefinitely. It will not grow larger or smaller as the woman's weight changes. Asymmetry can develop if a woman gains or loses a large amount of weight.

The autologous procedures all carry a risk of flap failure—loss of blood supply to the tissue forming the new breast. If a large portion of the flap develops inadequate blood supply, another reconstructive technique may be necessary. TRAM flap procedures can result in decreased muscle tone and weakness in the abdomen and/or abdominal **hernia**. Arm weakness may occur after latissimus dorsi flap surgery.

Normal results

A normal result of breast reconstruction depends on the woman's goals and expectations. It will not be the same as the breast it replaces. In general, it should be similar in size and shape to the opposite breast, but will have less sensation and be less mobile than a natural breast. A reconstruction using implants will usually be firmer and rounder than the other breast. It may feel cooler to touch, depending on the amount of tissue over it. Scars are unavoidable, but should be as unobtrusive as possible.

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U.S. Department of Health and Human Services, U.S. Food and Drug Administration, Office of Consumer Affairs. 5600 Fishers Lane, Rockville, MD 20857. (800) 532-4440. <http://www.fda.gov/fdahomepage.html>.

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Breast reduction

Definition

Breast reduction is a surgical procedure performed in order to decrease the size of the breasts.

Purpose

Women with very large breasts (macromastia or mammary hyperplasia) seek breast reduction for relief of **pain** in the back, shoulder, and neck. They may also feel uncomfortable about their breast size and have difficulty finding clothing that will fit properly. Additionally, breast reduction may be needed after reconstructive surgery following the surgical removal of cancerous breast tissue (**mastectomy**), to make the breasts more symmetric.

Men who have enlarged breasts (**gynecomastia**) may also be candidates for breast reduction. However, excessive alcohol intake, **smoking marijuana**, or using anabolic steroids may cause gynecomastia, and surgery is not recommended for men who continue to use these products.

Precautions

Breast reduction is not recommended for women whose breasts are not fully developed or who plan to breast feed.

Description

Breast reduction may also be called reduction mammaplasty. It is most often done in the hospital, under general anesthetic. However, studies have suggested that an outpatient procedure, using local anesthetic and mild **sedation** may be appropriate for some patients. The operation takes approximately two to four hours. The most commonly made incision encircles the areola (darkened area around the nipple) and extends downward and around the underside of the breast. This produces the least conspicuous scar. The excess tissue, fat, and skin are removed, and the nipple and areola are repositioned. In certain cases, **liposuction** (fat suctioning) is used to

KEY TERMS

Gynecomastia—Overly developed or enlarged breasts in a male.

Macromastia—Excessive size of the breasts.

Mammary hyperplasia—Increased size of the breast.

remove extra fat from the armpit area. A hospital stay of up to three days may be needed for recovery.

If deemed medically necessary, breast reduction is covered by some insurance plans. However, a specified amount of breast tissue may need to be removed in order to qualify for coverage. Surgeon's fees range from $4,800-$6,500 and up.

Preparation

Consultation between surgeon and patient is important to ensure that the woman understands and agrees with the expected final results of the procedure. Measurements and photographs may be taken. Many doctors also recommend a mammogram before the operation, to make sure there is no **cancer**.

Aftercare

After the surgery, an elastic bandage or special supportive bra is placed over gauze bandages and drainage tubes. The bandages and tubes are removed in a day or two. The bra will need to be worn around the clock for several weeks. Stitches are removed one to three weeks after the operation. Normal activities, including sexual relations may be restricted for several weeks. Scars will typically remain red, and perhaps lumpy for up to several months, but will gradually fade and become less noticeable. It may take up to a year before the breasts achieve their final position and size.

Risks

Risks common to any operation include bleeding, infection, anesthesia reactions, or unexpected scarring. Breast reduction may result in decreased feeling in the breasts or nipples and/or impaired ability to breastfeed. When healing is complete, the breasts may be slightly uneven, or the nipples may be asymmetric.

Normal results

Smaller breast size should be achieved, and with that, the accompanying pain and discomfort should be alleviated.

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American Society of Plastic and Reconstructive Surgeons. 44 E. Algonquin Rd., Arlington Heights, IL 60005. (847) 228-9900. <http://www.plasticsurgery.org>.

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Breast self-examination

Definition

A breast self-examination (BSE) is an inspection by a woman of her breasts to detect **breast cancer**.

Purpose

A BSE is one of three tests the American **Cancer** Society recommends to help detect breast cancer in its earliest stages. By regularly examining her own breasts, a woman is more likely to find any changes that may have occurred. The best time to perform a BSE is about a week after a woman's period ends, when her breasts are not tender or swollen. If her periods are not regular, a BSE should be completed on the same day every month. A BSE should also be regularly completed by women who are pregnant, breastfeeding, or have **breast implants**. By combining a BSE with a **mammography** and clinical breast examination, a woman is offered the best opportunity for reducing chances of **death** from breast cancer through early detection. Close to 90% of breast cancers are found through a BSE. The American Cancer Society recommends that beginning at the age of 20, women complete a BSE each month by feeling for lumps or anything suspicious, as well as looking at their breasts carefully in a mirror for any changes in contour, swelling, dimpling, puckering of the skin, or changes in the nipple.

Description

To complete a monthly BSE:

- When lying down, place a pillow under the right shoulder and position the right arm behind the head. Using the finger pads of the three middle fingers on the left hand, check the entire breast area. Use small circles and follow an up-and-down pattern while pressing firmly enough to know how the breast feels from month to month. This exam should then be repeated on the left

breast using the finger pads of the right hand with the pillow under the left shoulder.

- When standing before a mirror, any changes in the shape or look of the breasts should be checked. In order to look for any skin or nipple changes such as dimpling or nipple discharge, the arms should first be placed at the sides and then overhead. Hands are then placed firmly on hips to flex chest muscles, and then the body should be bent forward.
- When taking a shower, the right arm should be raised. By using soapy hands and fingers flat the right breast and outer part of the breast can be examined. The same small circles and up-and-down pattern used when lying down should be used in an upright position. Repeat on the left breast.

Preparation

Before beginning a monthly BSE, a woman's breasts should be completely exposed.

Normal results

Each woman's breasts has their own normal look and feel. By completing a BSE each month, a woman can determine what is normal for her and check for changes that may arise. A regular pattern of lumpiness in the breasts is normal.

Abnormal results

If any changes are noticed during a monthly BSE, such as a new, hard lump in the breast or underarms, a doctor should examine the area immediately. Other trouble signs that should not be ignored include:

- change in breast size or shape
- dimpling or puckering of the skin
- redness, swelling, or warmth that does not go away
- a **pain** in one area that does not vary with a woman's monthly cycle
- a nipple that pulls in
- discharge from the nipple that begins suddenly and appears only in one breast
- one nipple that has an itchy, sore, or scaling area

Beth A. Kapes

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American Cancer Society. (800) 227-2345. <http://www.cancer.org>.

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Breast sonogram *see* **Breast ultrasound**

Breast ultrasound

Definition

Breast ultrasound (or sonography) is an imaging technique for diagnosing breast disease, such as **cancer**. It uses harmless, high frequency sound waves to form an image (sonogram). The sound waves pass through the breast and bounce back or echo from various tissues to form a picture of the internal structures. It is not invasive and involves no radiation.

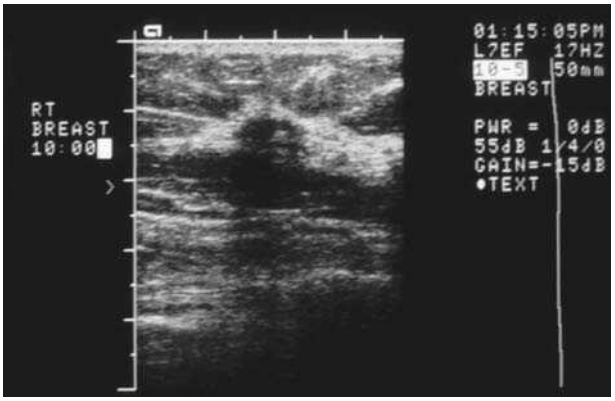
Purpose

Breast ultrasound may be used in several ways. The most common application is to investigate a specific area of the breast where a problem is suspected. A palpable lump and/or a lump or density discovered by x ray (mammogram) can be further evaluated by ultrasound. It is especially helpful in distinguishing between a fluid-filled cyst and a solid mass. It can also identify small lesions that are too tiny to be felt.

Breast ultrasound is often the first study performed to evaluate masses in women under 35 whose mammograms can be difficult to interpret due to the density of their breast tissue. The lack of radiation used with ultrasound makes it ideal for studying breast abnormalities in women who are pregnant. Assessing **breast implants** for leakage or rupture is another way ultrasound is used. Breast inflammation, where pockets of infection or abscesses may form, can be diagnosed and monitored by ultrasound.

Thickened and swollen breast skin may be a sign of inflammatory **breast cancer**. Ultrasound can sometimes identify a cancerous growth within the breast causing the thickened skin. These cases are usually followed by a core biopsy guided by ultrasound (described below).

Breast ultrasound is employed to observe and guide a needle for several interventional procedures. These include cyst aspiration, fine needle aspiration, large core needle



A breast ultrasound image. *(Custom Medical Stock Photo. Reproduced by permission.)*

biopsy (as a first step in determining treatment for a lesion that is likely to be cancerous), and needle localization in surgical **breast biopsy**. Biopsies guided by ultrasound have distinct advantages. The ultrasound guides the needle so that a lesion can be removed for the biopsy. Patients usually find that the procedure is less traumatic and more comfortable than surgical biopsies. Ultrasound is known for its accuracy in determining how far a cancerous growth extends into the surrounding tissue in lesions that cannot be felt. Biopsies guided by ultrasound are generally less costly than surgical biopsies. Additionally, if the abnormality that requires biopsy can be seen on both a mammogram and ultrasound, an ultrasound-guided biopsy is often more comfortable for the patient as no compression is necessary.

Description

Ultrasound can be done in a doctor's office or another outpatient setting, such as a hospital or imaging center.

The patient removes her clothing from the waist up and puts on a hospital gown, open in the front. She lies on her back or side on an examining table. A gel that enhances sound transmission is spread over the area to be examined. The technologist then places a transducer, an instrument about the size of an electric shaver, against the skin. The images from reflected sound waves appear on a monitor screen.

A good ultrasound study is difficult to obtain if the patient is unable to remain quietly in one position. **Obesity** may hinder clear viewing of internal structures, and the accuracy of an ultrasound study is highly dependent on the skill of the person performing the examination. The images recorded vary with the angle and pressure of the transducer and the equipment settings. The examination may take from 30 to 45 minutes. Most insurance plans cover the cost of an ultrasound examination.

KEY TERMS

Cyst—A thin-walled, fluid-filled benign structure in the breast.

Ductal carcinoma—A type of cancer that accounts for as much as 80% of breast cancers. These tumors feel bigger than they look on ultrasound or mammogram.

Fibroadenoma—A benign breast growth made up of fibrous tissue. It is the most common mass in women under 35 years of age, and is found in both breasts in 3% of cases.

Infiltrating lobular carcinoma—A type of cancer that accounts for 8% to 10% of breast cancers. In breasts that are especially dense, ultrasound can be useful in identifying these masses.

Microcalcifications—Tiny flecks that are too small to be felt. They are important markers of cancer that show up on ultrasound and mammogram.

Mucinous (colloid) carcinoma—A type of cancer that accounts for 1% to 2% of breast cancers. Resembles medullary carcinoma in ultrasound and mammogram, but usually affects older women.

Nonpalpable—Cannot be felt by hand. In cancer, growths that are nonpalpable are too small to be felt, but may be seen on ultrasound or mammogram.

Papillary carcinoma—A type of breast cancer that primarily occurs in older women. On ultrasound, this type of tumor may look like a solid or complex mass, or it may show up as solid tissue protruding into a cyst.

Tubular carcinoma—A type of cancer that accounts for approximately 1% to 2% of breast cancers. Can appear small on ultrasound or mammogram.

Normal results

An ultrasound examination may reveal either normal tissue or a benign condition such as a cyst. Ultrasound can confidently diagnose a benign structure that has certain characteristics of a simple cyst. In the case of a simple cyst with no symptoms, additional treatment beyond continued observation is usually not needed.

Abnormal results

A potentially malignant mass can be identified by breast ultrasound. Abnormal results fall into the following

categories: benign fibrous nodule, complex cyst, suspicious lesion, and lesion highly suggestive of cancer. In cases where ultrasound shows the presence of a complex cyst or fibrous nodule, a biopsy is justified because 10% to 15% of these growths are malignant. Lesions falling into the last two categories (suspicious or highly suggestive of cancer) have a higher chance of being cancerous, and should be investigated further, either by biopsy or surgery.

Breast cancers such as the following may be identified on ultrasound: ductal carcinoma, infiltrating lobular carcinoma, medullary carcinoma, mucinous (colloid) carcinoma, tubular carcinoma, and papillary carcinoma. On ultrasound, the shape of a lesion and the type of edges it has can sometimes indicate if it is benign or cancerous, but there are exceptions. For example, benign fibroadenomas are usually oval, and some cancers can be similarly shaped. Cancerous tumors usually have jagged edges, but some benign growths can have these edges as well. Ultrasound is not a definitive test. Tissue diagnosis is often required.

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Ellen S. Weber

Breast x ray *see* **Mammography**

Breech birth

Definition

Breech birth is the delivery of a fetus (unborn baby) hind end first. Between 3-4% of fetuses will start labor in the breech position, which is a potentially dangerous situation.

Description

Throughout most of **pregnancy**, the developing fetus is completely free to move around within the uterus. Between 32-36 weeks, it becomes so large that movement is restricted. It is much harder for the fetus to turn over, so whatever position it has assumed by this point is likely to be the same position that he or she will be in when labor begins.

For reasons that are not fully understood, almost all unborn babies settle into a head down position. The fetus is upside down in the uterus, and the head will lead the way during the birth process.

Unfortunately, some fetuses do not cooperate. Most of these are in the breech position. The buttocks lead the way out of the uterus, and the legs are folded in front of the body (frank breech). Delivery from the breech position poses far more risks than delivery head first (vertex position).

The biggest part of the fetus's body is usually its head. If the head fits through the mother's pelvis, then the rest of the fetus's body should slip out fairly easily. If the fetus is born bottom first, it is possible that the body will fit through the mother's pelvis, but the baby's head will get stuck at the level of the chin. This condition, known as a trapped head, is very dangerous.

When the baby's head comes first, it has a chance to "mold" during labor. The bones of the baby's skull are not yet fastened together the way they are in a child or adult's skull, meaning that the bones of the baby's skull can move. During the long hours of labor the skull can change shape to fit through the pelvis more easily, which is why many babies are born with a "cone head". If the baby is born from the breech position, the skull does not have a chance to change shape to fit the pelvis, and it is even more likely to get stuck.

If the baby's head gets trapped, the possibility of injury is high. Once the baby's body is born, the umbilical cord usually stops pulsating (just as it would during a normal delivery). This cuts off the oxygen supply from the mother to the baby. If the baby's head is still inside the uterus the baby cannot yet breathe on its own. Therefore, it is essential to deliver the baby as quickly as possible.

The life saving attempts to deliver the baby's head can cause injury to the baby's neck or head resulting in permanent handicaps. In extreme cases, if the baby cannot be delivered within a few minutes, the baby might die. Obviously, it is critical to avoid a breech delivery with a trapped head.

Of course, many babies are safely delivered from the breech position. There are certain factors that make a breech delivery more likely to be successful: if ultra-

sound (a technique that uses sound waves to visualize the fetus) shows that the fetus is in the frank breech position, the fetus's head is tucked on its chest, and the fetus is not big, it is less likely that its head will get stuck.

Among breech babies born after the full nine-month term, smaller babies usually do better. This is not true for premature babies. Premature babies are more likely to have a trapped head because the body of a premature baby is usually much smaller than his or her head. Premature babies are generally not delivered from the breech position.

The risks of vaginal breech delivery can be avoided by delivering the baby through a surgical procedure (**cesarean section**, also known as c-section). For the past twenty years, cesarean section has been recommended when the fetus is breech. More recently, many providers have offered the option of version, attempting to turn the fetus within the uterus to a head first position before labor begins.

Version is based on a very simple idea. If a fetus in the breech position does a somersault, it will end up head down. During a version, the obstetrician tries to make the fetus do a somersault.

A version should only be done in a hospital, with an ultrasound machine used to guide the obstetrician in turning the fetus. The fetus should be monitored with a fetal monitor before and after the version. Some obstetricians give the mother an injection of medication to relax the mother's uterus and prevent any contractions.

During the procedure, the obstetrician places his or her hands on the mother's abdomen to feel the location of the unborn baby's buttocks and head. The buttocks are lifted up slightly and the doctor pushes on the baby's head to encourage him to perform a somersault. It may take several tries before the fetus cooperates, but over half will eventually turn.

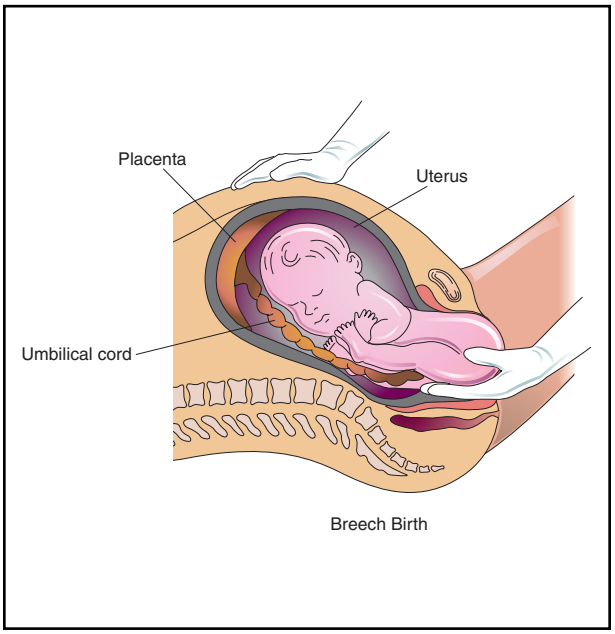
A version is not appropriate for every fetus who is in the breech position at the end of pregnancy. It can only be tried if there is one fetus in the uterus, if the placenta is not lying in front of the fetus, and if the umbilical cord does not appear to be wrapped around the fetus at any point.

Causes and symptoms

The cause of breech birth is not known. There are generally no identifiable symptoms. However, some women can tell the position of the fetus by where they feel the fetus kicking. Most women cannot tell what position the fetus is in at any given moment.

Diagnosis

A health care provider can often tell the position of the fetus by feeling it through the wall of the mother's abdomen. Another clue to the position is the location where the heartbeat is heard best. If the fetus's heartbeat is best heard below the level of the mother's navel, it is likely to be positioned head first. On the other hand, if the heartbeat is best heard above the level of the navel, it is likely to be breech.



Approximately 3-4% of babies will start labor in the breech (buttocks first) position. While this is a potentially dangerous situation, many full-term babies can be safely delivered from the breech position. *(Illustration by Electronic Illustrators Group.)*

The only way to really be sure, however, is to do an ultrasound exam. Using this technique it is very easy to tell the position of the fetus.

Treatment

If a fetus is in the breech position in the last weeks of pregnancy, there are three possible courses of action: Cesarean section, attempted version, or vaginal breech delivery.

Cesarean section is the most common way to deliver a breech baby. This surgical procedure carries more risk for the mother, but many women prefer to take the risk of surgery on themselves rather than let the baby face the risks of breech delivery.

Version is gaining in popularity. Version is a medical procedure in which the obstetrician tries to turn the breech fetus to the head first position. Version is successful more than 50% of the time. However, some babies who are successfully turned will turn back to the breech position after the procedure is done.

Some women choose breech vaginal delivery. This should only be attempted if ultrasound shows that the fetus is in a favorable breech position. Most babies will do very well during a breech delivery, but it is always possible that the fetus will be injured, perhaps seriously.

Prevention

There is no way to prevent a fetus from settling into the breech position at the end of pregnancy. A woman who has had one breech fetus is more likely than average to have another.

Amy B. Tuteur, MD

Resources

BOOKS

"Techniques for Breech Delivery." In *Williams Obstetrics*. 20th ed. Ed. F. Gary Cunningham, et al. Stamford: Appleton & Lange, 1997.

Breech presentation *see* **Breech birth**

Brill-Zinsser disease *see* **Typhus**

Brittle bone disease *see* **Osteogenesis imperfecta**

Broken nose *see* **Nasal trauma**

Bronchiectasis

Definition

Bronchiectasis is a condition in which an area of the bronchial tubes is permanently and abnormally widened (dilated), with accompanying infection.

Description

The bronchial tubes are the networks of branching tubes which deliver air to the tiny sacs of the lungs (alveoli). In bronchiectasis, the diameter of the bronchi is unusually large. Examination of the walls of the bronchial tubes reveals destruction of the normal structural elements, with replacement by scar tissue. Pus collects within the bronchi, and the normal flow of oxygen into the lungs, and carbon dioxide out of the lungs (air exchange) is impaired. The bronchi show signs of inflammation, with swelling and invasion by a variety of immune cells. The inflamed areas show signs of increased growth of blood vessels. The area of the lung which should be served by a diseased bronchial tube is also prone to inflammation and infection.

Causes and symptoms

Prior to the widespread use of immunizations, bronchiectasis was often the result of a serious infection with either **measles** or **whooping cough**. Currently, viruses that cause **influenza** (flu) or influenza-like syndromes, as well as a number of bacteria may precede the development of bronchiectasis. Patients who have been infected with **tuberculosis** or the virus which causes **AIDS** (HIV or human **immunodeficiency** virus) also have an increased chance of bronchiectasis.

A number of pre-existing conditions may cause an individual to be more susceptible than normal to infection, with increased risk of bronchiectasis developing. These conditions include disorders of cilia, and immune disorders.

Cilia are the tiny hairs which usually line the bronchial tubes. Cilia wave constantly, sweeping the bronchial tubes clean of bacterial or viral invaders, and cleaning away excess secretions (mucus, sputum) which may be produced by the bronchi. When these cilia are abnormal or absent at birth, various bacterial or viral invaders may remain in the respiratory tract, multiply, and cause serious infections.

Immune disorders include decreased production of certain immune chemicals (immunoglobulins) which usually serve to fight off infection by bacterial or viral invasion. When these immunoglobulins are not produced in large enough quantity, bacterial and viral invaders are not effectively killed off, and infection occurs.

Other causes of bronchiectasis include an abnormally blocked (obstructed) airway. This can be due to tumor growth within the bronchial tube, or due to a child accidentally inhaling a small object which then blocks off the bronchial tube. People with the disease called **cystic fibrosis** (CF) often have their bronchial tubes obstructed by the thick, sticky mucus which is a hallmark of CF. Toxic exposures (breathing ammonia, for example) can harm the bronchi, and lead to bronchiectasis. An extreme allergic response of the immune system to the presence of certain fungi (especially one called *Aspergillus*) can also damage the bronchial tubes enough to result in bronchiectasis.

Symptoms of bronchiectasis include constant **cough** and the production of infected sputum (sputum is a mixture of mucus and pus), which may be bloody. In some cases, there may be **wheezing** and **shortness of breath**. The constant, low-level of infection may flare, resulting in increased production of sputum, worsening of the cough, and **fever**. The area of the lung served by the affected bronchial tube may become severely infected, resulting in **pneumonia**.

Colorized bronchogram of lungs—right tree has almost no structure caused by chronic inflammation. *(Mehau Kulyk, Photo Researchers. Reproduced by permission.)*

Diagnosis

Chest x ray may reveal evidence of bronchiectasis, and CT scans are particularly good at revealing the thick, dilated bronchial walls of bronchiectasis. Sputum will need to be collected and cultured (grown in a laboratory dish), in order to examine it microscopically for the specific type of organism responsible for infection. A careful search for other underlying diseases is important, looking in particular for ciliary abnormalities, cystic fibrosis, or immunoglobulin deficiencies.

Treatment

Treatment should involve efforts to resolve any underlying disorder. Infections will require **antibiotics**, obstruction may require the removal of a foreign object or tumor. Medications are available to help thin the sputum, so that it can be more effectively coughed up. Rhythmic clapping on the chest and back, while the patient assumes a number of positions (head down, primarily), may help the lungs to drain more effectively. This is called **chest physical therapy**, or percussion and postural drainage.

When a particular area of the lung is constantly and severely infected, surgery may be needed to remove it. When bleeding occurs from irritated bronchial tubes and overgrown bronchial blood vessels, surgery may be required either to remove an area of the bronchial tube, or to inject the bleeding blood vessel with a material to stop the bleeding.

In some patients, bronchiectasis eventually leads to a constantly low level of blood oxygen, despite other treatments. These patients usually have an associated increase in the size of the right side of their hearts, along with a decrease in the heart's ability to pump blood through the lungs. Some patients with extremely severe symptoms and disability have been treated with **lung transplantation**.

KEY TERMS

Bronchi—The network of tubular passages which carry air to the lung and allow air to be expelled from the lungs.

Cilia—Hair-like projections which line the bronchial tubes (also present in other areas of the body). Normal cilia beat consistently, sweeping the bronchi clean of bacteria, viruses, and mucus.

Prognosis

Prognosis varies widely, depending on how widespread or focal the bronchiectasis, and the presence of other underlying disorders.

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Weinberger, Steven E., and Ann Giudici Fettner. "Disease in Disguise: Bronchiectasis." *Harvard Health Letter* 21 (Feb. 1996): 6+.

ORGANIZATIONS

American Lung Association. 1740 Broadway, New York, NY 10019. (800) 586-4872. <http://www.lungusa.org>.

Rosalyn Carson-DeWitt, MD

Bronchiolitis *see* **Respiratory syncytial virus infection**

Bronchitis

Definition

Bronchitis is an inflammation of the air passages between the nose and the lungs, including the windpipe or

trachea and the larger air tubes of the lung that bring air in from the trachea (bronchi). Bronchitis can either be of brief duration (acute) or have a long course (chronic). Acute bronchitis is usually caused by a viral infection, but can also be caused by a bacterial infection and can heal without complications. Chronic bronchitis is a sign of serious lung disease that may be slowed but cannot be cured.

Description

Although acute and chronic bronchitis are both inflammations of the air passages, their causes and treatments are different. Acute bronchitis is most prevalent in winter. It usually follows a viral infection, such as a cold or the flu, and can be accompanied by a secondary bacterial infection. Acute bronchitis resolves within two weeks, although the **cough** may persist longer. Acute bronchitis, like any upper airway inflammatory process, can increase a person's likelihood of developing **pneumonia**.

Anyone can get acute bronchitis, but infants, young children, and the elderly are more likely to get the disease because people in these age groups generally have weaker immune systems. Smokers and people with heart or other lung diseases are also at higher risk of developing acute bronchitis. Individuals exposed to chemical fumes or high levels of air pollution also have a greater chance of developing acute bronchitis.

Chronic bronchitis is a major cause of disability and **death** in the United States. The American Lung Association estimates that about 14 million Americans suffer from the disease. Like acute bronchitis, chronic bronchitis is an inflammation of airways accompanied by coughing and spitting up of phlegm. In chronic bronchitis, these symptoms are present for at least three months in each of two consecutive years.

Chronic bronchitis is caused by inhaling bronchial irritants, especially cigarette smoke. Until recently, more men than women developed chronic bronchitis, but as the number of women who smoke has increased, so has their rate of chronic bronchitis. Because this disease progresses slowly, middle-aged and older people are more likely to be diagnosed with chronic bronchitis.

Chronic bronchitis is one of a group of diseases that fall under the name chronic obstructive pulmonary disease (COPD). Other diseases in this category include **emphysema** and chronic asthmatic bronchitis. Chronic bronchitis may progress to emphysema, or both diseases may be present together.

Causes and symptoms

Acute bronchitis

Acute bronchitis usually begins with the symptoms of a cold, such as a runny nose, sneezing, and dry cough. However, the cough soon becomes deep and painful. Coughing brings up a greenish yellow phlegm or sputum. These symptoms may be accompanied by a **fever** of up to 102°F (38.8°C). **Wheezing** after coughing is common.

In uncomplicated acute bronchitis, the fever and most other symptoms, except the cough, disappear after three to five days. Coughing may continue for several weeks. Acute bronchitis is often complicated by a bacterial infection, in which case the fever and a general feeling of illness persist. To be cured, the bacterial infection should be treated with **antibiotics**.

Chronic bronchitis

Chronic bronchitis is caused by inhaling respiratory tract irritants. The most common irritant is cigarette smoke. The American Lung Association estimates that 80-90% of COPD cases are caused by **smoking**. Other irritants include chemical fumes, air pollution, and environmental irritants, such as mold or dust.

Chronic bronchitis develops slowly over time. The cells that line the respiratory system contain fine, hairlike outgrowths from the cell called cilia. Normally, the cilia of many cells beat rhythmically to move mucus along the airways. When smoke or other irritants are inhaled, the cilia become paralyzed or snap off. When this occurs, the cilia are no longer able to move mucus, and the airways become inflamed, narrowed, and clogged. This leads to difficulty breathing and can progress to the life-threatening disease emphysema.

A mild cough, sometimes called smokers' cough, is usually the first visible sign of chronic bronchitis. Coughing brings up phlegm, although the amount varies considerably from person to person. Wheezing and **shortness of breath** may accompany the cough. Diagnostic tests show a decrease in lung function. As the disease advances, breathing becomes difficult and activity decreases. The body does not get enough oxygen, leading to changes in the composition of the blood.

Diagnosis

Initial diagnosis of bronchitis is based on observing the patient's symptoms and health history. The physician will listen to the patient's chest with a stethoscope for specific sounds that indicate lung inflammation, such as moist rales and crackling, and wheezing, that indicates airway narrowing. Moist rales is a bubbling sound heard with a stethoscope that is caused by fluid secretion in the bronchial tubes.

A **sputum culture** may be performed, particularly if the sputum is green or has blood in it, to determine whether a bacterial infection is present and to identify the disease-

causing organism so that an appropriate antibiotic can be selected. Normally, the patient will be asked to cough deeply, then spit the material that comes up from the lungs (sputum) into a cup. This sample is then grown in the laboratory to determine which organisms are present. The results are available in two to three days, except for tests for **tuberculosis**, which can take as long as two months.

Occasionally, in diagnosing a chronic lung disorder, the sample of sputum is collected using a procedure called a **bronchoscopy**. In this procedure, the patient is given a local anesthetic, and a tube is passed into the airways to collect a sputum sample.

A **pulmonary function test** is important in diagnosing chronic bronchitis and other variations of COPD. This test uses an instrument called a spirometer to measure the volume of air entering and leaving the lungs. The test is done in the doctor's office and is painless. It involves breathing into the spirometer mouthpiece either normally or forcefully. Volumes less than 80% of the normal values indicate an obstructive lung disease.

To better determine what type of obstructive lung disease a patient has, the doctor may do a **chest x ray**, electrocardiogram (ECG), and blood tests. An electrocardiogram is an instrument that is used to measure the electrical activity of the heart and is useful in the diagnosis of heart conditions. Other tests may be used to measure how effectively oxygen and carbon dioxide are exchanged in the lungs.

KEY TERMS

Acute—Disease or condition characterized by the rapid onset of severe symptoms.

Bronchi—The larger air tubes of the lung that bring air in from the trachea.

Chronic—Disease or condition characterized by slow onset over a long period of time.

Chronic obstructive pulmonary disease (COPD)—A term used to describe chronic lung diseases, like chronic bronchitis, emphysema, and asthma.

Emphysema—One of the several diseases called chronic obstructive pulmonary diseases, emphysema involves the destruction of air sac walls to form abnormally large air sacs that have reduced gas exchange ability and that tend to retain air within the lungs. Symptoms include labored breathing, the inability to forcefully blow air out of the lungs, and an increased susceptibility to respiratory tract infections.

Treatment

Acute bronchitis

When no secondary infection is present, acute bronchitis is treated in the same way as the **common cold**. Home care includes drinking plenty of fluids, resting, not smoking, increasing moisture in the air with a cool mist humidifier, and taking **acetaminophen** (Datril, Tylenol, Panadol) for fever and **pain**. **Aspirin** should not be given to children because of its association with the serious illness, **Reye's syndrome**.

Cough suppressants are used only when the cough is dry and produces no sputum. If the patient is coughing up phlegm, the cough should be allowed to continue. The purpose of the cough it to bring up extra mucus and irritants from the lungs. When coughing is suppressed, the mucus accumulates in the plugged airways and can become a breeding ground for pneumonia bacteria.

Expectorant cough medicines, unlike cough suppressants, do not stop the cough. Instead they are used to thin the mucus in the lungs, making it easier to cough up. This type of cough medicine may be helpful to individuals suffering from bronchitis. People who are unsure about what type of medications are in over-the-counter cough syrups should ask their pharmacist for an explanation.

If a secondary bacterial infection is present, the infection is treated with an antibiotic. Patients need to take the entire amount of antibiotic prescribed. Stopping the antibiotic early can lead to a return of the infection. Tetracycline or ampicillin are often used to treat adults. Other possibilities include trimethoprim/sulfamethoxazole (Bactrim or Septra) and the newer erythromycin-like drugs, such as azithromycin (Zithromax) and clarithromycin (Biaxin). Children under age eight are usually given amoxicillin (Amoxil, Pentamox, Sumox, Trimox), because tetracycline discolors permanent teeth that have not yet come in.

Chronic bronchitis

The treatment of chronic bronchitis is complex and depends on the stage of chronic bronchitis and whether other health problems are present. Lifestyle changes, such as quitting smoking and avoiding secondhand smoke or polluted air, are an important first step. Controlled exercise performed on a regular basis is also important.

Drug therapy begins with **bronchodilators**. These drugs relax the muscles of the bronchial tubes and allow increased air flow. They can be taken by mouth or inhaled using a nebulizer. A nebulizer is a device that delivers a regulated flow of medication into the airways.

Common bronchodilators include albuterol (Ventolin, Proventil, Apo-Salvent) and metaproterenol (Alupent, Orciprenaline, Metaprel, Dey-Dose).

Anti-inflammatory medications are added to reduce swelling of the airway tissue. **Corticosteroids**, such as prednisone, can be taken orally or intravenously. Other steroids are inhaled. Long-term steroid use can have serious side effects. Other drugs, such as ipratropium (Atrovent), are given to reduce the quantity of mucus produced.

As the disease progresses, the patient may need supplemental oxygen. Complications of COPD are many and often require hospitalization in the latter stages of the disease.

Alternative treatment

Alternative practitioners focus on prevention by eating a healthy diet that strengthens the immune system and practicing **stress** management. Bronchitis can become serious if it progresses to pneumonia, therefore, antibiotics may be required. In addition, however, there are a multitude of botanical and herbal medicines that can be formulated to treat bronchitis. Some examples include inhaling eucalyptus or other essential oils in warm steam. Herbalists recommend a tea made of mullein (*Verbascum thapsus*), coltsfoot (*Tussilago farfara*), and anise seed (*Pimpinella anisum*). Homeopathic medicine and **traditional Chinese medicine** may also be very useful for bronchitis, and **hydrotherapy** can contribute to cleaning the chest and stimulating immune response.

Prognosis

When treated, acute bronchitis normally resolves in one to two weeks without complications, although a cough may continue for several more weeks. The progression of chronic bronchitis, on the other hand, may be slowed, and an initial improvement in symptoms may be achieved. Unfortunately, however, there is no cure for chronic bronchitis, and the disease can often lead to or coexist with emphysema. Taken together, all forms of COPD are a leading cause of death.

Prevention

The best way to prevent bronchitis is not to begin smoking or to stop smoking. Smokers are ten times more likely to die of COPD than non-smokers. Smokers who stop show improvement in lung function. Other preventative steps include avoiding chemical and environmental irritants, such as air pollution, and maintaining good overall health. Immunizations against certain types of pneumonia (as well as **influenza**) are an important preventative measure for anyone with lung or immune system diseases.

Resources

BOOKS

Shayevits, Myra, Berton Shayevits, and the editors of Consumer Reports Books. *Living Well with Chronic Asthma, Bronchitis, and Emphysema.* Consumer Report Books, 1991.

PERIODICALS

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ORGANIZATIONS

American Lung Association. 1740 Broadway, New York, NY 10019. (800) 586-4872. <http://www.lungusa.org>.

National Heart, Lung and Blood Institute. P.O. Box 30105, Bethesda, MD 20824-0105. (301) 251-1222. <http://www.nhlbi.nih.gov>.

National Jewish Center for Immunology and Respiratory Medicine. 1400 Jackson St., Denver, CO 80206. (800) 222-5864. <http://www.nationaljewish.org/main.html>.

Tish Davidson

Bronchodilators

Definition

Bronchodilators are medicines that help open the bronchial tubes (airways) of the lungs, allowing more air to flow through them.

Purpose

People with **asthma** have trouble breathing, because their airways are inflamed and become narrowed. Normally, air moves smoothly from the mouth and nose through the airways and into the tiny air sacs of the lungs as a person breathes in. Breathing out (exhaling) happens automatically when the person stops breathing in. In a person with asthma, breathing in (inhaling) is not a problem. Incoming air can slide around the blockage, because the act of breathing in makes the airways expand. The problem comes when the person with asthma tries to breathe out. The air can no longer get past the blockage, and it remains trapped in the lungs. The person can then only take shallow breaths. Bronchodilators work by relaxing the smooth muscles that line the airways. This makes the airways open wider and allows air to leave the lungs. These drugs also are used to relieve breathing problems associated with **emphysema**, chronic **bronchitis**, and other lung diseases.

Description

Some bronchodilators are inhaled, using a nebulizer or an inhalation aerosol. Others are taken as injections or by mouth. Most are available only by prescription, but a few, such as ephedrine, can be bought without a physician's prescription. Examples of bronchodilators are albuterol (Proventil, Ventolin), epinephrine (Primatene), ipratropium (Atrovent), metaproterenol (Alupent, Metaprel), and terbutaline (Brethine).

Recommended dosage

The recommended dosage depends on the type of bronchodilator and may be different for different patients. Check with the physician who prescribed the drug or the pharmacist who filled the prescription for the correct dosage.

Precautions

Bronchodilators come with patient instructions. Be sure to carefully read them before using the medicine. If there is any confusion about how to use the medicine, check with the physician or pharmacist. Always use these medicines exactly as directed. Taking larger than recommended doses or using the medicine too often can lead to serious side effects and even **death**.

If symptoms do not improve or if they get worse after using a bronchodilator, call a physician right away.

Although some bronchodilators are available without a physician's prescription, these medicines should not be used unless a physician has diagnosed the patient's condition as asthma.

Some asthma experts believe that the overuse of bronchodilators can cause asthma to get worse. They advise patients and their physicians to consider controlling asthma with anti-inflammatory drugs including inhaled steroids such as beclomethasone dipropionate (Beclovent, Vanceril), flunisolide (AeroBid) or triamcinolone acetonide (Azmacort) Ideally, asthma should be controlled with an inhaled steroid that is used along with the bronchodilator. The more the inhaled steroid steroid controls the inflammation that causes the asthma, the less bronchodilator the patient needs to use because symptoms are under control.

Persons with diabetes should be aware that the bronchodilator epinephrine may raise their blood sugar levels.

Patients who are using an aerosol bronchodilator and an aerosol form of either ipratropium or a corticosteroid such as beclomethasone dipropionate (Beclovent, Vanceril) should use the bronchodilator first, then wait 5 minutes before using the other medicine. Check with a physician before using any other inhaled medications or other asthma medicines. The physician must determine the proper amount of time between doses.

Some bronchodilator products contain sulfites, that trigger an allergic reaction in certain people. Anyone who has a sulfite allergy should read the label carefully or check with a physician or pharmacist before using a bronchodilator. Call a physician immediately if any of these signs of an allergic reaction to sulfite occur:

- bluish coloration of the skin
- flushed or red face or skin
- faintness
- severe **dizziness**
- increased **wheezing** or other breathing problems
- skin rash, **hives**, or **itching**
- swelling of the face, lips, or eyelids

Special conditions

People with certain medical conditions or who are taking certain other medicines can have problems if they use bronchodilators. Before using these drugs, be sure to let the physician know about any of these conditions:

ALLERGIES. Anyone who has had unusual reactions to any bronchodilator or an inhaled form of any other drug in the past should let his or her physician know before taking the drugs again. The physician should also be told about any **allergies** to foods, dyes, preservatives, or other substances.

Patients who are allergic to soybeans, soy lecithin, peanuts, or drugs based on atropine should not use the bronchodilator ipratropium (Atrovent).

PREGNANCY. In studies of laboratory animals, some bronchodilators cause **birth defects** or **miscarriage** when the animals are given doses many times the usual human dose. Whether these drugs cause such problems in humans in unknown. Any woman who is pregnant or plans to become pregnant should check with her physician before using a bronchodilator.

BREASTFEEDING. Some bronchodilators pass into breast milk. Breastfeeding mothers should check with their physicians before using bronchodilators.

OTHER MEDICAL CONDITIONS. Before using bronchodilators, people with any of these medical problems should make sure their physicians are aware of their conditions:

- glaucoma
- brain damage

KEY TERMS

Anti-inflammatory—Medicine used to relieve swelling, pain, and other symptoms of inflammation.

Bronchitis—Inflammation of the air passages of the lungs.

Chronic—A word used to describe a long-lasting condition. Chronic conditions often develop gradually and involve slow changes.

Emphysema—A lung disease in which breathing becomes difficult.

Inflammation—Pain, redness, swelling, and heat that usually develop in response to injury or illness.

Nebulizer—A device that turns liquid forms of medicine into a fine spray that can be inhaled.

Sulfite—A type of preservative that causes allergic reactions in some people.

- convulsions (seizures)—recently or anytime in the past
- mental illness
- parkinson's disease
- diabetes
- heart or blood vessel diseases
- rapid or irregular heartbeat
- high blood pressure
- overactive thyroid
- enlarged prostate
- obstruction of the neck of the bladder

USE OF CERTAIN MEDICINES. Using bronchodilators with certain other drugs may affect the way the drugs work or may increase the chance of side effects.

Side effects

Some patients have a dry or irritated throat or a **dry mouth** after using bronchodilators. To help prevent these problems, gargle and rinse the mouth or take a sip of water after each dose.

The most common side effects are nervousness or restlessness and trembling. These problems usually go away as the body adjusts to the drug and do not require medical treatment. Less common side effects, such as bad taste in the mouth, coughing, dizziness or lightheadedness, drowsiness, **headache**, sweating, fast or pounding heartbeat, muscle cramps or twitches, nausea, vomiting, **diarrhea**, sleep problems and weakness also may occur and do not need medical attention unless they do not go away or they interfere with normal activities.

More serious side effects are not common, but may occur. If any of the following side effects occur, check with the physician who prescribed the medicine as soon as possible:

- chest **pain** or discomfort
- irregular or fluttery heartbeat
- unusual bruising
- hives or rash
- swelling
- wheezing or other breathing problems
- numbness in the hands or feet
- blurred vision

Other side effects are possible. Anyone who has unusual symptoms after using a bronchodilator should get in touch with his or her physician.

Interactions

Bronchodilators may interact with a number of other medicines. When this happens, the effects of one or both of the drugs may change or the risk of side effects may be greater. Anyone who takes these drugs should let the physician know all other medicines he or she is taking. Among the drugs that may interact with bronchodilators are:

- monoamine oxidase inhibitors (MAO inhibitors) such as phenelzine (Nardil) and tranylcypromine (Parnate), used to treat depression
- other bronchodilators
- tricyclic antidepressants such as amitriptyline (Elavil) and imipramine (Tofranil)
- beta blockers such as propranolol (Inderal) and atenolol (Tenormin), used to control high blood pressure
- digitalis medicines, used to treat heart conditions, such as digoxin (Lanoxin)
- drugs, such as certain **diuretics** (water pills), that lower potassium levels
- ergoloid mesylates such as Hydergine, used to treat symptoms of **Alzheimer's disease** or multiple small stokes
- ergotamine (Cafergot, Ergostat, and other brands), used to treat migraine and cluster headaches
- the antidepressant maprotiline (Ludiomil)

The list above does not include every drug that may interact with bronchodilators. Be sure to check with a physician or pharmacist before combining bronchodilators with any other prescription or nonprescription (over-the-counter) medicine.

Resources

PERIODICALS

Fackelmann, Kathy A. "Anti-inflammatory Drugs May Quell Asthma." *Science News* (26 Sept. 1992): 197.

ORGANIZATIONS

Asthma and Allergy Foundation of America. 1233 20th Street, NW, Suite 402, Washington, DC 20036. (800) 727-8462. <http://www.aafa.org>.

American Academy of Allergy, Asthma, and Immunology. 611 East Wells St., Milwaukee, WI 53202. (800) 822-2762. <http://www.aaaai.org>.

National Heart, Lung and Blood Institute. P.O. Box 30105, Bethesda, MD 20824-0105. (301) 251-1222. <http://www.nhlbi.nih.gov>.

Nancy Ross-Flanigan

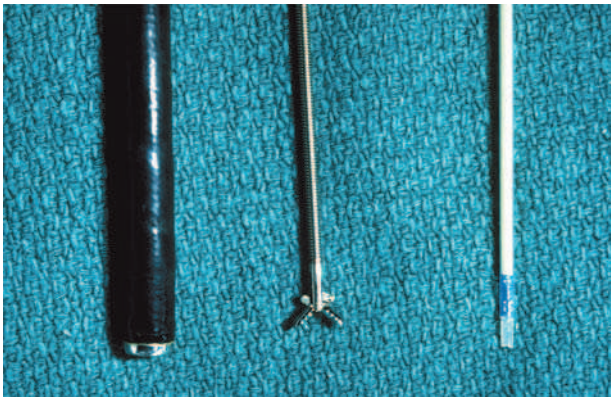
Bronchoscopy

Definition

Bronchoscopy is a procedure in which a cylindrical fiberoptic scope is inserted into the airways. This scope contains a viewing device that allows the visual examination of the lower airways.

Purpose

During a bronchoscopy, a physician can visually examine the lower airways, including the larynx, trachea, bronchi, and bronchioles. The procedure is used to examine the mucosal surface of the airways for abnormalities that might be associated with a variety of lung diseases. Its use includes the visualization of airway obstructions such as a tumor, or the collection of specimens for the diagnosis of **cancer** originating in the bronchi of the lungs (bronchogenic cancer). It can also be used to collect specimens for culture to diagnose infectious diseases such as **tuberculosis**. The type of specimens collected can include sputum (composed of saliva and discharges from the respiratory passages), tissue samples from the bronchi or bronchioles, or cells collected from washing the lining of the bronchi or bronchioles. The instrument used in bronchoscopy, a bronchoscope, is a slender cylindrical instrument containing a light and an eyepiece. There are two types of bronchoscopes, a rigid tube that is sometimes referred to as an open-tube or ventilating bronchoscope, and a more flexible fiberoptic tube. This tube contains four smaller passages—two for light to pass through, one for seeing through and one that can accommodate medical instruments that may be used for biopsy or suctioning, or that medication can be passed through.



Instruments used in bronchoscopy procedures. *(Custom Medical Stock Photo. Reproduced by permission.)*

Bronchoscopy may be used for the following purposes:

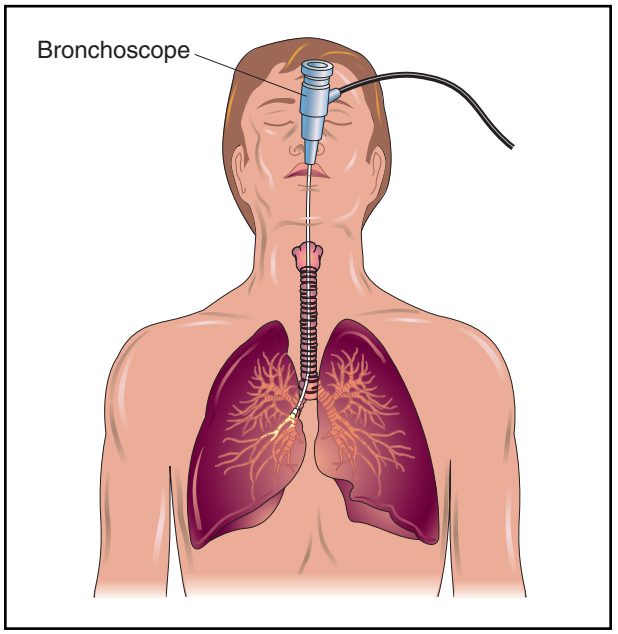
- to diagnose cancer, tuberculosis, lung infection, or other lung disease
- to examine an inherited deformity of the lungs
- to remove a foreign body in the lungs, such as a mucus plug, tumor, or excessive secretions
- to remove tissue samples, also known as biopsy, to test for cancer cells, help with staging the advancement of the lung cancer, or to treat a tumor with laser therapy
- to allow examination of a suspected tumor, obstruction, secretion, bleeding, or foreign body in the airways
- to determine the cause of a persistent **cough**, **wheezing**, or a cough that includes blood in the sputum
- to evaluate the effectiveness of lung cancer treatments

Precautions

Patients not breathing adequately on their own due to severe **respiratory failure** may require mechanical ventilation prior to bronchoscopy. It may not be appropriate to perform bronchoscopy on patients with an unstable heart condition. All patients must be constantly monitored while undergoing a bronchoscopy so that any abnormal reactions can be dealt with immediately.

Description

There are two types of bronchoscopes, a rigid tube and a fiberoptic tube. Because of its flexibility, the fiberop-



Bronchoscopy is a procedure in which a hollow, flexible tube is inserted into the airways, allowing the physician to visually examine the lower airways, including the larynx, trachea, bronchi, and bronchioles. It can also be used to collect specimens for bacteriological culture to diagnose infectious diseases such as tuberculosis. *(Illustration by Electronic Illustrators Group.)*

tic tube is usually preferred. However, if the purpose of the procedure is to remove a foreign body caught in the windpipe or lungs of a child, the more rigid tube must be used because of its larger size. The patient will either lie face-up on his/her back or sit upright in a chair. Medication to decrease secretions, lessen **anxiety**, and relax the patient are often given prior to the procedure. While breathing through the nose, anesthesia is sprayed into the mouth or nose to numb it. It will take one to two minutes for the anesthesia to take effect. Once this happens, the bronchoscope will be put into the patient's mouth or nose and moved down into the throat. While the bronchoscope is moving down the throat, additional anesthesia is put into the bronchoscope to numb the lower parts of the airways. Using the eyepiece, the physician then observes the trachea and bronchi, and the mucosal lining of these passageways, looking for any abnormalities that may be present.

If the purpose of the bronchoscopy is to take tissue samples or biopsy, forceps or a bronchial brush are used to obtain cells. If the purpose is to identify an infectious agent, a bronchoalveolar lavage (BAL) can be used to gather fluid for culture purposes. Also, if any foreign matter is found in the airways, it can be removed.

Another procedure using bronchoscopy is called fluorescence bronchoscopy. This can be used to detect precancerous cells present in the airways. By using a fluorescent light in the bronchoscope, precancerous tissue will appear dark red, while healthy tissue will appear green. This technique can help detect lung cancer at an early stage, so that treatment can be started early.

Alternative procedures

Depending upon the purpose of the bronchoscopy, alternatives might include a computed tomography scan (CT) or no procedure at all. Bronchoscopy is often performed to investigate an abnormality that shows up on a **chest x ray** or CT scan. If the purpose is to obtain biopsy specimens, one option is to perform surgery, which carries greater risks. Another option is percutaneous (through the skin) biopsy guided by computed tomography.

Preparation

The doctor should be informed of any **allergies** and all the medications that the patient is currently taking. The doctor may instruct the patient not to take medications like **aspirin** or anti-inflammatory drugs, which interfere with clotting, for a period of time prior to the procedure. The patient needs to fast for 6 to 12 hours prior to the procedure and refrain from drinking any liquids the day of the procedure. The bronchoscopy takes about 45 to 60 minutes, with results usually available in one day. Prior to the bronchoscopy, several tests may be done, including a chest x ray and blood work. Sometimes a bronchoscopy is done under general anesthesia. Patients usually have an intravenous (IV) line in the arm. Most likely, the procedure will be done under local anesthesia, which is sprayed into the nose or mouth. This is necessary to decrease the gag reflex. A sedative may also be used to help the patient relax. It is important that the patient understands that at no time will the airway be blocked and that oxygen can be supplied through the bronchoscope. A signed consent form is necessary for this procedure.

Aftercare

After the bronchoscopy, the patient will be monitored for vital signs such as heart rate, blood pressure, and breathing, while resting in bed. Sometimes patients have an abnormal reaction to anesthesia. All saliva should be spit into a basin so that it can be examined for the presence of blood. If a biopsy was taken, the patient should not cough or clear the throat as this might dislodge any blood clot that has formed and cause bleeding. No food or drink should be consumed for about two hours after the procedure or until the anesthesia wears off. Diet is gradually progressed from ice chips and clear liquids to the patient's regular diet. There will also be a temporary **sore throat** and hoarseness that may last for a few days.

KEY TERMS

Anesthesia—A drug used to loss of sensation. It is used to lessen the pain of surgery and medical procedures.

Bronchi—The network of tubular passages that carry air to the lungs and allow air to be expelled from the lungs.

Bronchioles—Small airways extending from the bronchi into the lobes of the lungs.

Bronchoalveolar lavage—Washing cells from the air sacs at the end of the bronchioles.

Trachea—The windpipe.

Risks

Minor side effects arise from the bronchoscope causing abrasion of the lining of the airways. This results in some swelling and inflammation, as well as hoarseness caused from abrading the vocal cords. If this abrasion is more serious, it can lead to respiratory difficulty or bleeding of the airway lining. A more serious risk involved in having a bronchoscopy performed is the occurrence of a **pneumothorax**, due to puncturing of the lungs, which allows air to escape into the space between the lung and the chest wall. These risks are greater with the use of a rigid bronchoscope than with a fiberoptic bronchoscope. If a rigid tube is used, there is also a risk of chipped teeth.

Normal results

Normal tracheal appearance consists of smooth muscle with C-shaped rings of cartilage at regular intervals. The trachea and the bronchi are lined with a mucous membrane.

Abnormal results

Abnormal bronchoscopy findings may involve abnormalities of the bronchial wall such as inflammation, swelling, ulceration, or anatomical abnormalities. The bronchoscopy may also reveal the presence of abnormal substances in the trachea and bronchi. If samples are taken, the results could indicate cancer, disease-causing agents or other lung disease. Other abnormalities include constriction or narrowing (stenosis), compression, dilation of vessels, or abnormal branching of the bronchi. Abnormal substances that might be found in the airways include blood, secretions, or mucous plugs. Any abnormalities are discussed with the patient.

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American College of Chest Physicians. 3300 Dundee Rd., Northbrook, IL 60062. (800) 343-2227. <www.chestnet.org>.

Cindy L. Jones, Ph.D.

Brucellosis

Definition

Brucellosis is a bacterial disease caused by members of the *Brucella* genus that can infect humans but primarily infects livestock. Symptoms of the disease include intermittent **fever**, sweating, chills, aches, and mental depression. The disease can become chronic and recur, particularly if untreated.

Description

Also known as undulant fever, Malta fever, Gibraltar fever, Bang's disease, or Mediterranean fever, brucellosis is most likely to occur among those individuals who regularly work with livestock. The disease originated in domestic livestock but was passed on to wild animal species, including the elk and buffalo of the western United States. In humans, brucellosis continues to be spread via unpasteurized milk obtained from infected cows or through contact with the discharges of cattle and goats during **miscarriage**. In areas of the world where milk is not pasteurized, for example in Latin America and the Mediterranean, the disease is still contracted by ingesting unpasteurized dairy products. However, in the United States, the widespread pasteurization of milk and nearly complete eradication of the infection from cattle has reduced the number of human cases from 6,500 in 1940 to about 70 in 1994.

Causes and symptoms

The disease is caused by several different species of parasitic bacteria of the genus Brucella. *B. abortus* is found in cattle and can cause cows to abort their fetuses.

KEY TERMS

Antibody—A specific protein produced by the immune system in response to a specific foreign protein or particle called an antigen.

Chronic—Disease or condition characterized by slow onset over a long period of time.

Parasite—An organism living in or on, and obtaining nourishment from, another organism.

Pasteurization—The process of applying heat, usually to milk or cheese, for the purpose of killing, or retarding the development of, pathogenic bacteria.

B. suis is most often found in hogs and is more deadly when contracted by humans than the organism found in cattle. *B. melitensis* is found in goats and sheep and causes the most severe illness in humans. *B. rangiferi* infects reindeer and caribou, and *B. canis* is found in dogs.

A human contracts the disease by coming into contact with an infected animal and either allowing the bacteria to enter a cut, breathing in the bacteria, or by consuming unpasteurized milk or fresh goat cheese obtained from a contaminated animal. In the United States, the disease is primarily confined to slaughterhouse workers.

Scientists do not agree about whether brucellosis can be transmitted from one person to another, although some people have been infected from a tainted blood **transfusion** or bone marrow transplant. Newborn babies have also contracted the illness from their mothers during birth. Currently, it is believed that brucellosis can also be transmitted sexually.

The disease is not usually fatal, but the intermittent fevers (a source of its nickname, "undulant fever") can be exhausting. Symptoms usually appear between five days and a month after exposure and begin with a single bout of high fever accompanied by shivering, aching, and drenching sweats that last for a few days. Other symptoms may include **headache**, poor appetite, backache, weakness, and depression. Mental depression can be so severe that the patient may become suicidal.

In rare, untreated cases, the disease can become so severe that it leads to fatal complications, such as **pneumonia** or bacterial **meningitis**. *B. melitensis* can cause miscarriages, especially during the first three months of **pregnancy**. The condition can also occur in a chronic form, in which symptoms recur over a period of months or years.

Diagnosis

Brucellosis is usually diagnosed by detecting one or more *Brucella* species in blood or urine samples. The bacteria may be positively identified using biochemical methods or using a technique whereby, if present in the sample, the brucellosis bacteria are made to fluoresce. Brucellosis may also be diagnosed by culturing and isolating the bacteria from one of the above samples. Blood samples will also indicate elevated antibody levels or increased amounts of a protein produced directly in response to infection with brucellosis bacteria.

Treatment

Prolonged treatment with **antibiotics**, including **tetracyclines** (with streptomycin), co-trimoxazole, and **sulfonamides**, is effective. Bed rest is also imperative. In the chronic form of brucellosis, the symptoms may recur, requiring a second course of treatment.

Prognosis

Early diagnosis and prompt treatment is essential to prevent chronic infection. Untreated, the disease may linger for years, but it is rarely fatal. Relapses may also occur.

Prevention

There is no human vaccine for brucellosis, but humans can be protected by controlling the disease in livestock. After checking to make sure an animal is not already infected, and destroying those that are, all livestock should be immunized. Butchers and those who work in slaughterhouses should wear protective glasses and clothing, and protect broken skin from infection.

Some experts suggest that a person with the disease refrain from engaging in unprotected sex until free of the disease. The sexual partners of an infected person should also be closely monitored for signs of infection.

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ORGANIZATIONS

Centers for Disease Control and Prevention. 1600 Clifton Rd., NE, Atlanta, GA 30333. (800) 311-3435, (404) 639-3311. <http://www.cdc.gov>.

National Institute of Allergies and Infectious Diseases, Division of Microbiology and Infectious Diseases. Building 31, Room. 7A-50, 31 Center Drive MSC 2520, Bethesda, MD 20892. <http://www.niaid.nih.gov>.

World Health Organization, Division of Emerging and Other Communicable Diseases Surveillance and Control. Avenue Appia 20, 1211 Geneva 27, Switzerland. (+00 41 22) 791 21 11. <http://www.who.int>.

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Carol A. Turkington

Brugian filariasis *see* **Elephantiasis**

Bruises

Definition

Bruises, or ecchymoses, are a discoloration and tenderness of the skin or mucous membranes due to the leakage of blood from an injured blood vessel into the tissues. Pupura refers to bruising as the result of a disease condition. A very small bruise is called a petechia. These often appear as many tiny red dots clustered together, and could indicate a serious problem.

Description

Bruises change colors over time in a predictable pattern, so that it is possible to estimate when an injury occurred by the color of the bruise. Initially, a bruise will be reddish, the color of the blood under the skin. After one to two days, the red blood cells begin to break down, and the bruise will darken to a blue or purplish color. This fades to green at about day six. Around the eighth or ninth day, the skin over the bruised area will have a brown or yellowish appearance, and it will gradually diminish back to its normal color.

Long periods of standing will cause the blood that collects in a bruise to seep through the tissues. Bruises

A close-up view of woman's bruised left eye. *(Custom Medical Stock Photo. Reproduced by permission.)*

are actually made of little pools of blood, so the blood in one place may flow downhill after awhile and appear in another. For instance, bruising in the back of the abdomen may eventually appear in the groin; bruising in the thigh or the knee will work its way down to the ankle.

Causes and symptoms

Healthy people may develop bruises from any injury that doesn't break through the skin. Vigorous **exercise** may also cause bruises due to bringing about small tears in blood vessels walls. In a condition known as purpura simplex, there is a tendency to bruise easily due to an increased fragility of the blood vessels. Bruises also develop easily in the elderly, because the skin and blood vessels have a tendency to become thinner and more fragile with **aging**, and there is an increased use of medications that interfere with the blood clotting system. In the condition known as purpura senilis, the elderly develop bruises from minimal contact that may take up to several months to completely heal.

The use of nonsteroidal anti-inflammatories such as ibuprofen (Advil) and naproxen (Aleve) may lead to increased bruising. **Aspirin**, antidepressants, **asthma** medications, and cortisone medications also have this effect. The anti-clotting medications also known as blood thinners, especially the drug Warfarin (Coumadin), may be the cause of particularly severe bruising.

Sometimes bruises are connected with more serious illnesses. There are a number of diseases that cause excessive bleeding or bleeding from injuries too slight to have consequences in healthy people. An abnormal tendency to bleed may be due to hereditary bleeding disorders, certain prescription medications, diseases of the

blood such as leukemia, and diseases that increase the fragility of blood vessels. If there are large areas of bruising or bruises develop very easily, this may herald a problem. Other causes that should be ruled out include liver disease, **alcoholism**, drug **addiction**, and acquired immune deficiency syndrome (**AIDS**). Bruising that occurs around the navel may indicate dangerous internal bleeding; bruising behind the ear, called Battle's sign, may be due to a skull fracture; and raised bruises may point to autoimmune disease.

Diagnosis

Bruising is usually a minor problem, which does not require a medical diagnosis. However, faced with extensive bruising, bruising with no apparent cause, or bruising in certain locations, a physician will pursue an evaluation that will include a number of blood tests. If the area of the bruise becomes hard, an x ray may be required.

Treatment

A bruise by itself needs no medical treatment. It is often recommended that ice packs be applied on and off during the first 24 hours of injury to reduce the bruising. After that, heat, especially moist heat, is recommended to increase the circulation and the healing of the injured tissues. Rest, elevation of the effected part, and compression with a bandage will also retard the accumulation of blood. Rarely, if a bruise is so large that the body cannot completely absorb it or if the site becomes infected, it may have to be surgically removed.

Alternative treatment

Several types of topical applications are usually recommend to speed healing and to reduce the **pain** associated with bruises. Vitamin K cream can be applied directly to the site of injury. Astringent herbs such as witch hazel, *Hamamelis virginiana*, can be used. This will tighten the tissues and therefore diminish the bruising. The homeopathic remedy, *Arnica montana*, can be applied as a cream or gel to unbroken skin.

Oral homeopathic remedies may reduce bruising, pain, and swelling as well. *Arnica montana*, at 30 ml (1 oz), taken one to two times per day is highly recommended. For ledum, 30 ml (1 oz) one to two times per day is also useful.

Prognosis

The blood under the skin which causes the discoloration of bruising should be totally reabsorbed by the body in three weeks or less. At that time, the skin color should completely return to normal.

Sometimes, a bruise may become solid and increase in size instead of dissolving. This may indicate blood trapped in the tissues, which may be need to be drained. This is referred to as a hematoma. Less commonly, the body may develop calcium deposits at the injury site in a process called heterotopic ossification.

Prevention

Vitamin K promotes normal clotting in the blood, and therefore may help reduce the tendency to bruise easily. Green leafy vegetables, alfalfa, broccoli, seaweed, and fish liver oils are dietary sources of vitamin K. Other good foods to eat would be those containing bioflavonoids, such as reddish-blue berries. These can assist in strengthening the connective tissue, which will decrease the spread of blood and bruising. Zinc and vitamin C supplements are also recommended for this.

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Patience Paradox

Bruton's agammaglobulinemia *see* **X-linked agammaglobulinemia**

Bruxism

Definition

Bruxism is the habit of clenching and grinding the teeth. It most often occurs at night during sleep, but it may also occur during the day. It is an unconscious behavior, perhaps performed to release **anxiety**, aggression, or anger.

Description

Bruxism is one of the oldest disorders known, and approximately one in four adults experiences it. Most people are not aware of it before their teeth have been damaged.

Causes and symptoms

While bruxism is typically associated with **stress**, it may also be triggered by abnormal occlusion (the way the upper and lower teeth fit together), or crooked or missing teeth.

Symptoms of bruxism include: dull headaches; sore and tired facial muscles; earaches; sensitive teeth; and locking, popping, and clicking of the jaw.

During a dental examination, a dentist may recognize damage resulting from bruxism, including: enamel loss from the chewing surfaces of teeth; flattened tooth surfaces; loosened teeth; and fractured teeth and fillings. Left untreated, bruxism may lead to tooth loss and jaw dysfunction.

Diagnosis

Medical and dental histories and examinations are necessary to differentiate bruxism from other conditions that may cause similar **pain**, such as ear infections, dental infections, and temporomandibular joint (TMJ) dysfunction. However, uncommonly worn-down teeth strongly suggest a diagnosis of bruxism.

Treatment

To prevent further damage to the teeth, bruxism is treated by placing a removable, custom-fitted plastic appliance called a night guard between the upper and lower teeth. Although the clenching and grinding behavior may continue, the teeth wear away the plastic instead of each other.

In some cases, abnormal occlusion may be adjusted and high spots removed so that the teeth fit together in a more comfortable position. Missing teeth may be replaced and crooked teeth may be straightened with orthodontic treatment to eliminate possible underlying causes of bruxism. In cases where jaw muscles are very tight, a dentist may prescribe **muscle relaxants**.

Alternative treatment

Stress management and behavior modification techniques may be useful to break the habit of clenching and teeth grinding. Tight jaw muscles may be relaxed by applying warm compresses to the sides of the face. Herbal muscle relaxants also can be helpful. **Massage therapy** and deep tissue realignment, including **rolfing**, can assist in releasing the clenching pattern. This is a more permanent alternative treatment for bruxism.

Prognosis

Bruxism may cause permanent damage to teeth and chronic jaw pain unless properly diagnosed and promptly treated. The behavior may be eliminated if its underlying causes are found and addressed.

KEY TERMS

Enamel—The hard outermost surface of a tooth.

High spot—An area of a tooth or restoration that feels abnormal or uncomfortable because it hits its opposing tooth before other teeth meet.

Night guard—A removable, custom-fitted plastic appliance that fits between the upper and lower teeth to prevent them from grinding against each other.

Occlusion—The way upper and lower teeth fit together during biting and chewing.

Rolfing—Based on the belief that proper alignment of various parts of the body is necessary for physical and mental health, rolfing uses deep tissue massage and movement exercises in an attempt to bring the body into correct alignment.

Temporomandibular joint (TMJ)—The jaw joint formed by the mandible (lower jaw bone) moving against the temporal bone of the skull.

Prevention

Increased awareness in patients prone to anxiety, aggression, or anger may prevent the habit of bruxism from developing.

Resources

ORGANIZATIONS

Academy of General Dentistry. Suite 1200, 211 East Chicago Ave., Chicago, IL 60611.(312) 440-4300. <http://www.agd.org>.

American Dental Association. 211 E. Chicago Ave., Chicago, IL 60611. (312) 440-2500. <http://www.ada.org>.

Bethany Thivierge

Bubonic plague *see* **Plague**

Budd-Chiari syndrome

Definition

Budd-Chiari syndrome is a rare problem that results from blood clotting in the veins flowing out of the liver

KEY TERMS

Ascites—Accumulation of fluid in the abdomen.

Biopsy—Surgical removal of a tiny bit of tissue for examination under the microscope.

Catheter—A tubular surgical instrument.

Phlebitis—Inflammation of a vein.

Polycythemia rubra vera—An excess number of red blood cells in the blood.

Sickle cell disease—An inherited disease in which red blood cells take an unusual shape, leading to circulation problems.

(hepatic veins). The high pressure of blood in these veins leads to an enlarged liver, and to an accumulation of fluid in the abdomen, called **ascites**.

Description

The liver, the largest internal organ in the human body, is responsible for many vital physiologic processes. Blood flow through the liver nourishes the liver, carries in substances that the liver will process, and carries away substances that the liver has produced. When blood cannot flow out freely from the liver, blood pressure rises in the veins of the liver, leading to blood clots within the liver. Also, some of the blood plasma can leak through the walls of the veins and accumulate within the abdomen (ascites).

Causes and symptoms

The major symptoms include **pain** in the upper right-hand portion of the abdomen and a build-up of fluid in the abdomen. In the United States, blood disorders are the most common causes. Among these disorders are polycythemia rubra vera (an increase in the number of red blood cells), and **sickle cell disease**. In parts of the world where **liver cancer** is common, a form of liver **cancer** is the most frequent cause.

Other causes sometimes include:

- certain infections
- use of **oral contraceptives**
- body changes in **pregnancy** and the postpartum period
- phlebitis (inflammation of a vein)
- injury to the abdomen
- membranous webs (especially in Asia)

Diagnosis

Diagnosis of Budd-Chiari syndrome can be made by an internist (a specialist in diseases of the internal organs), a gastroenterologist (a specialist in the diseases of the digestive system), or a general surgeon. On **physical examination**, the doctor will note that the liver is larger than normal. Often an ultrasound scan of the liver will show abnormalities in the size of the liver, an abnormal pattern of the veins in the liver, and other abnormalities. A CT scan will often show similar abnormalities.

Once these abnormalities are confirmed, the key test is called hepatic vein catheterization. In this test, a narrow tube is snaked through the body until it reaches the hepatic veins. An instrument at the tip of the catheter can measure the pressure within each segment of the hepatic vein.

In some cases, a tiny amount of radioactive material is injected into a patient, and then an abnormal pattern of radioactivity in the liver can be revealed. In other cases, a **liver biopsy** enables a physician to examine cells from the liver itself. Cells damaged by Budd-Chiari syndrome have a characteristic appearance easily identifiable to a physician.

Treatment

Surgery

Most patients with Budd-Chiari syndrome must have surgery. A surgeon will re-route blood flow around the clotted hepatic vein into a large vein called the vena cava. The exact technique will depend on the specific location of the clots and other factors. In certain patients, other surgical techniques may be used. For patients who otherwise would have less than six months to live, **liver transplantation** is sometimes performed.

In a few patients, a "balloon catheter" can open the blocked blood vessels, without the need for major surgery.

Drugs

Sometimes, anti-clotting drugs such as urokinase can be used for patients with a sudden onset of clotting in the veins of the liver. These drugs do not seem to work when the clots have become established.

Prognosis

If surgery is done before permanent liver damage sets in, long-term survival is possible. In these cases, damaged liver cells can actually recover. If patients are already very sick with liver disease, the surgery may not be as helpful.

Prevention

The best approach to prevention is to carefully control the blood disorders that can lead to Budd-Chiari syndrome.

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Richard H. Lampert

Buerger's disease

Definition

Buerger's disease is an inflammation of the arteries, veins, and nerves in the legs, principally, leading to restricted blood flow. Left untreated, Buerger's disease can lead to **gangrene** of the affected areas. Buerger's disease is also known as thromboangitis obliterans.

Causes and symptoms

The exact cause of Buerger's disease is not known. It is seen most often in young to middle-aged men (ages 20-40) who are heavy smokers of cigarettes. Cases of this disease in non-smokers are very rare, hence, cigarette **smoking** is considered a causative factor. Approximately 40% of the patients have a history of inflammation of a vein (phlebitis), which may play a role in the development of Buerger's disease. The disease is mainly seen in the legs of affected persons, but may also appear in their arms. Early symptoms include decrease in the blood supply (arterial **ischemia**) and superficial (near the skin surface) phlebitis. The main symptom is **pain** in the affected areas. Onset of the disease is gradual and first occurs in the feet or hands. Inflammation occurs in small and medium-sized arteries and veins near the surface of the limb. In advanced cases, blood vessels in other parts of the body may be affected. There is a progressive decrease in the blood flow to the affected areas. The pulse in arteries of the feet is weak or undetectable. The lack of blood flow can lead to gangrene, which is decay of tissue due to restricted blood supply. A cold sensitivity in the hands, similar to that seen in **Raynaud's disease**, can develop. In this case, the hands turn color—white, blue, and then red—when exposed to the cold.

Diagnosis

Diagnosis is usually made from the clinical symptoms. Patients frequently complain of numbness, tingling, or burning sensations in the affected area before evidence of vascular inflammation becomes apparent.

KEY TERMS

Gangrene—A decay of the tissue in a part of the body that experiences restricted blood flow.

Inflammation—A local reaction to irritation, injury, or infection characterized by pain, swelling, redness, and occasional loss of function.

Ischemia—A decrease in the blood supply to an area of the body caused by obstruction or constriction of blood vessels.

Phlebitis—Inflammation of a vein.

Treatment

There is no effective medication or surgery for this disease. Patients must stop smoking to halt further development of the symptoms. **Vasodilators**, drugs that increase the diameter of the blood vessels, can be administered, but may not be effective. Exposure of affected areas to heat or cold should be avoided. Trauma to the feet and other affected areas should be avoided and infections must be treated promptly.

Prognosis

The disease is progressive in patients who do not stop smoking. Areas with gangrene must be removed surgically.

Prevention

Smoking is the only known causative agent for this disease and should be avoided.

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John T. Lohr, PhD

Bulging eyes *see* **Exophthalmos**

Bulimia nervosa

Definition

Bulimia nervosa is a serious and sometimes life-threatening eating disorder affecting mainly young

women. People with bulimia, known as bulimics, consume large amounts of food (binge) and then try to rid themselves of the food and calories (purge) by **fasting**, excessive **exercise**, vomiting, or using **laxatives**. The behavior often serves to reduce **stress** and relieve **anxiety**. Because bulimia results from an excessive concern with weight control and self-image, and is often accompanied by depression, it is also considered a psychiatric illness.

Description

Bulimia nervosa is a serious health problem for over two million adolescent girls and young women in the United States. The bingeing and purging activity associated with this disorder can cause severe damage, even **death**, although the risk of death is not as high as for **anorexia nervosa**, an eating disorder that leads to excessive weight loss.

Binge eating may in rare instances cause the stomach to rupture. In the case of purging, **heart failure** can result due to loss of vital **minerals** such as potassium. Vomiting causes other serious problems, including acid-related scarring of the fingers (if used to induce vomiting) and damage to tooth enamel. In addition, the tube that brings food from the mouth to the stomach (the esophagus) often becomes inflamed and salivary glands can become swollen. Irregular menstrual periods can also result, and interest in sex may diminish.

Most bulimics find it difficult to stop their behavior without professional help. Many typically recognize that the behavior is not normal, but feel out of control. Some bulimics struggle with other compulsive, risky behaviors such as drug and alcohol abuse. Many also suffer from other psychiatric illnesses, including clinical depression, anxiety, and **obsessive-compulsive disorder** (OCD).

Most bulimics are females in their teens or early 20s. Males account for only 5-10% of all cases. People of all races develop the disorder, but most of those diagnosed are white.

Bulimic behavior is often carried out in secrecy, accompanied by feelings of guilt or shame. Outwardly, many people with bulimia appear healthy and successful, while inside they have feelings of helplessness and low self-esteem.

Causes and symptoms

Causes

The cause of bulimia is unknown. Researchers believe that it may be caused by a combination of genetic and environmental factors. Bulimia tends to run in families. Research shows that certain brain chemicals, known as neurotransmitters, may function abnormally in acutely ill bulimia patients. Scientists also believe there may be a link between bulimia and other psychiatric problems, such as depression and OCD. Environmental influences include participation in work or sports that emphasize thinness, such as modeling, dancing, or gymnastics. Family pressures also may play a role. One study found that mothers who are extremely concerned about their daughters' physical attractiveness and weight may help to cause bulimia. In addition, girls with eating disorders tend to have fathers and brothers who criticize their weight.

Symptoms

According to the American Anorexia/Bulimia Association, Inc., warning signs of bulimia include:

- eating large amounts of food uncontrollably (bingeing)
- vomiting, abusing laxatives or **diuretics**, or engaging in fasting, dieting, or vigorous exercise (purging)
- preoccupation with body weight
- using the bathroom frequently after meals
- depression or mood swings
- irregular menstrual periods
- onset of dental problems, swollen cheeks or glands, **heartburn** or bloating

Diagnosis

Bulimia is treated most successfully when diagnosed early. But because the bulimic may deny there is a problem, getting medical help is often delayed. A complete **physical examination** in order to rule out other illnesses is the first step to diagnosis.

According to the American Psychiatric Association, a diagnosis of bulimia requires that a person have all of the following symptoms:

- recurrent episodes of binge eating (minimum average of two binge-eating episodes a week for at least three months)
- a feeling of lack of control over eating during the binges
- regular use of one or more of the following to prevent weight gain: self-induced vomiting, use of laxatives or diuretics, strict dieting or fasting, or vigorous exercise
- persistent over-concern with body shape and weight

Treatment

Early treatment is important otherwise bulimia may become chronic, with serious health consequences. A comprehensive treatment plan is called for in order to address the complex interaction of physical and psycho-

logical problems in bulimia. A combination of drug and behavioral therapies is commonly used.

Behavioral approaches include individual psychotherapy, **group therapy**, and **family therapy**. **Cognitive-behavioral therapy**, which teaches patients how to change abnormal thoughts and behavior, is also used. **Nutrition** counseling and self-help groups are often helpful.

Antidepressants commonly used to treat bulimia include desipramine (Norpramin), imipramine (Tofranil), and fluoxetine (Prozac). These medications also may treat any co-existing depression.

In addition to professional treatment, family support plays an important role in helping the bulimic person. Encouragement and caring can provide the support needed to convince the sick person to get help, stay with treatment, or try again after a failure. Family members can help locate resources, such as eating disorder clinics in local hospitals or treatment programs in colleges designed for students.

Alternative treatment

Light therapy—exposure to bright, artificial light—may be useful in reducing bulimic episodes, especially during the dark winter months. Some feel that massage may prove helpful, putting people in touch with the reality of their own bodies and correcting misconceptions of body image. **Hypnotherapy** may help resolve unconscious issues that contribute to bulimic behavior.

Prognosis

Bulimia may become chronic and lead to serious health problems, including seizures, irregular heartbeat, and thin bones. In rare cases, it may be fatal.

Timely therapy and medication can effectively manage the disorder and help the bulimic look forward to a normal, productive, and fulfilling life.

Prevention

There is no known method to prevent bulimia.

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ORGANIZATIONS

American Anorexia/Bulimia Association, Inc., 293 Central Park West, Suite IR, New York, NY 10024. (212) 501-8351.

Anorexia Nervosa and Related Eating Disorders, Inc., P.O. Box 5102, Eugene, OR 97405. (541) 344-1144.

Center for the Study of Anorexia and Bulimia, 1 W. 91st St., New York, NY 10024. (212) 595-3449.

Eating Disorder Awareness & Prevention, Inc., 603 Stewart St., Suite 803, Seattle, WA 98101. (206) 382-3587.

National Association of Anorexia Nervosa and Associated Disorders, Box 7, Highland Park, IL 60035. (708) 831-3438.

National Eating Disorders Organization, 6655 South Yale Ave, Tulsa, OK 74136. (918) 481-4044.

Jennifer Lamb

KEY TERMS

Binge—To consume large amounts of food uncontrollably within a short time period.

Diuretic—A drug that promotes the formation and excretion of urine.

Neurotransmitters—Certain brain chemicals that may function abnormally in acutely ill bulimic patients.

Obsessive-compulsive disorder (OCD)—A disorder that may accompany bulimia, characterized by the tendency to perform repetitive acts or rituals in order to relieve anxiety.

Purge—To rid the body of food and calories, commonly by vomiting or using laxatives.

Bulla *see* **Skin lesions**

Bumetanide *see* **Diuretics**

BUN *see* **Blood urea nitrogen test**

Bundle branch block

Definition

Bundle branch block (BBB) is a disruption in the normal flow of electrical pulses that drive the heart beat.

KEY TERMS

Electrocardiogram—The pattern of the heart's electrical impulses that indicate the order and condition of the heart's components.

QRS—A pattern seen in an electrocardiogram that indicates the pulses in a heart beat and their duration. Variations from a normal QRS pattern indicate heart disease.

Description

Bundle branch block belongs to a group of heart problems called intraventricular conduction defects (IVCD). There are two bundle branches, right and left. The right bundle carries nerve impulses that cause contraction of the right ventricle (the lower chamber of the heart) and the left bundle carries nerve impulses that cause contraction of the left ventricle. The two bundles initially are together at a junction called the bundle of His. Nerve impulses come through the sinus node of the heart to the bundle of His and then move into the right and left bundle branches. Bundle branch block is a slowing or interruption of nerve impulses. A problem may exist in any of the three bundles.

Patients with BBB are generally without symptoms unless the disease is severe enough to cause a complete infranodal A-V block and very slow heart rate. In patients with right bundle branch block (RBBB), the nerve impulse is conducted slowly or not at all. The right ventricle finally receives the impulse through muscle-to-muscle spread, outside the regular nerve pathway. This mechanism of impulse transmission is slow and results in a delayed contraction of the right ventricle. There are several types of left bundle branch block (LBBB), each producing its own characteristic mechanism of failure. In each case, the nerve impulse is blocked or delayed. Patients with LBBB may have left ventricular disease or cardiomyopathy.

Causes and symptoms

Left bundle branch block usually happens as a consequence of other diseases such as arteriosclerosis, **rheumatic fever**, **congenital heart disease**, **myocarditis**, myocardial infarction, metastatic heart tumors, or other invasions of the heart tissue. Right bundle branch block happens less often from underlying heart disease.

Diagnosis

Detection of BBB usually takes place during a normal **physical examination**. The block shows up as a widening of the second heart sound. Confirmation of BBB is obtained by electrocardiogram (ECG). The pattern seen in the electrocardiogram indicates pulses in a heart beat and their duration. A QRS duration of greater than 110 milliseconds is a diagnostic indication of BBB. There is a unique ECG pattern for blocks in each of the three bundles.

Treatment

There is no specific therapy for BBB. Patients are usually treated for associated heart diseases.

Prognosis

The prognosis of blockage in any of the three bundle branches depends on the prognosis of the associated heart disease. The associated diseases determine the outcome of the patient's health. Occasionally, disruptions in bundle branches lead to complete infranodal A-V block, a more serious blockage of nerve impulses. Approximately 2% of patients with BBB develop infranodal A-V blockage and these patients often require artificial **pacemakers**.

Resources

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Bunion

Definition

A bunion is an abnormal enlargement of the joint (the first metatarsophalangeal joint, or MTPJ) at the base of the great or big toe (hallux). It is caused by inflammation and usually results from chronic irritation and pressure from poorly fitting footwear.

Description

A displacement of two major bones of the foot (hallux valgus) causes bunions, although not everyone with this displacement will develop the joint swelling and bone overgrowth that characterize a bunion. One of the bones involved is called the first metatarsal bone. This bone is long and slender, with the big toe attached on one

end and the other end connected to foot bones closer to the ankle. This foot bone is displaced in the direction of the four other metatarsals connected with the toes. The other bone involved is the big toe itself, which is displaced toward the smaller toes. As the big toe continues to move toward the smaller toes, it may become displaced under or over the second toe. The displacement of these two foot bones causes a projection of bone on the inside portion of the forefoot. The skin over this projection often becomes inflamed from rubbing against the shoe, and a callus may form.

The joint contains a small sac (bursa) filled with fluid that cushions the bones and helps the joint to move smoothly. When a bunion forms, this sac becomes inflamed and thickened. The swelling in the joint causes additional **pain** and pressure in the toe.

Woman's right foot with bunion on big toe. *(Photograph by Wedgworth, Custom Medical Stock Photo. Reproduced by permission.)*

Causes and symptoms

Bunions may form as a result of abnormal motion of the foot during walking or running. One common example of an abnormal movement is an excessive amount of **stress** placed upon the inside of the foot. This leads to friction and irritation of the involved structures. Age has also been noted as a factor in developing bunions, in part because the underlying bone displacement worsens over time unless corrective measures are taken.

Wearing improperly fitting shoes, especially those with a narrow toe box and excessive heel height, often causes the formation of a bunion. This forefoot deformity is seen more often in women than men. The higher frequency in females may be related to the strong link between footwear fashion and bunions. In fact, in a recent survey of more than 350 women, nearly 90% wore shoes that were at least one size too small or too narrow.

Because genetic factors can predispose people to the hallux valgus bone displacement, a strong family history of bunions can increase the likelihood of developing this foot disorder. Various arthritic conditions and several genetic and neuromuscular diseases, such as **Down syndrome** and **Marfan syndrome**, cause muscle imbalances that can create bunions from displacement of the first metatarsal and big toe. Other possible causes of bunions are leg-length discrepancies, with the bunion present on the longer leg, and trauma occurring to the joint of the big toe.

Symptoms of bunions include the common signs of inflammation such as redness, swelling, and pain. The discomfort is primarily located along the inside of the foot just behind the big toe. Because of friction, a callus may develop over the bunion. If an overlapping of the toes is allowed, additional rubbing and pain occurs. Inflammation of this area causes a decrease in motion with associated discomfort in the joint between the big toe and the first metatarsal. If allowed to worsen, the skin over the bunion may break down causing an ulcer, which also presents a problem of potential infection. (Foot ulcers can be particularly dangerous for people with diabetes, who may have trouble feeling the ulcer forming and healing if it becomes infected.)

Diagnosis

A thorough medical history and physical exam by a physician is always necessary for the proper diagnosis of bunions and other foot conditions. X rays can help confirm the diagnosis by showing the bone displacement, joint swelling, and, in some cases, the overgrowth of bone that characterizes bunions. Doctors will also consider the possibility that the joint pain is caused by or complicated by arthritis (which causes destruction of the cartilage of the joint), **gout** (which causes the accumulation of uric acid crystals in the joint), tiny **fractures** of a bone in the foot (stress fractures), or infection and may order additional tests to rule out these possibilities.

Treatment

Conservative

The first step in treating a bunion is to remove as much pressure from the area as possible. People with bunions should wear shoes that have enough room in the toe box to accommodate the bunion and avoid high-heeled shoes and tight-fitting socks or stockings. Dressings and pads help protect the bunion from additional shoe pressure. The application of splints or customized shoe inserts (orthotics) to correct the alignment of the big toe joint is effective for many bunions. Most patients are instructed to

KEY TERMS

Orthopedics—A medical specialty concerned with treating diseases, injuries, and malformations of the bones and supporting structures, such as tendons, ligaments, and muscles.

Orthotic—A device or brace to control, correct, or compensate for a bone deformity.

Podiatry—A medical specialty concerned with treating diseases, injuries, and malformations of the feet.

rest or choose exercises that put less stress on their feet, at least until the misalignment is corrected. In some cases, physicians also use steroid injections with local anesthetic around the bunion to reduce inflammation.

Surgery

If conservative treatment is not successful, surgical removal of the bunion may be necessary to correct the deformity. This procedure is called a bunionectomy, and there are many variations on the operation, which is usually performed by a surgeon who specializes in treating bone conditions (orthopedics) or by one who specializes in treating the foot (podiatry). Surgeons consider the angle of the bone misalignment, the condition of the bursa, and the strength of the bones when they choose which procedure to use. Most bunionectomies involve the removal of a section of bone and the insertion of pins to rejoin the bone. Sometimes the surgeons may move ligaments (which connect bone to bone in the joint) or tendons (which connect bone to muscle) in order to realign the bones. After this procedure, the bones and other tissues are held in place while they heal by compression dressings or a short cast. The individual must refrain from vigorous **exercise** for six weeks.

Alternative treatment

Deep friction massage techniques by a physical or massage therapist can be helpful to increase circulation, reduce inflammation, and prevent soft tissue build up. Physical therapy also provides useful approaches such as ultrasound to help retard or reverse the formation of the bunion. Various taping techniques can be useful to realign the toe and decrease friction and rubbing that may be present. The homeopathic tissue salt *Calcarea phosphorica* can be useful in balancing the bone formation/remodeling.

Prognosis

Often modifications in footwear allow a good prognosis without surgery. If surgery is necessary, complete healing without complications requires approximately four to six weeks. Even after surgery corrects the bone misalignment, patients are usually instructed to continue wearing low-heeled, roomy shoes to prevent the bunion from reforming.

Prevention

Prevention begins with proper foot wear. Shoes with a wide and deep toe box are best. High-heeled shoes should not be worn for long periods of time. If a bunion is present and becomes inflamed, the foot should be elevated with the application of an ice pack over the painful area for not more than 20 minutes every other hour. If pain and swelling continue, a podiatrist or physician should be contacted.

Resources

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American Podiatry Medical Association. 9312 Old Georgetown Road, Bethesda, MD 20814.

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Burkitt's lymphoma *see* **Malignant lymphomas**

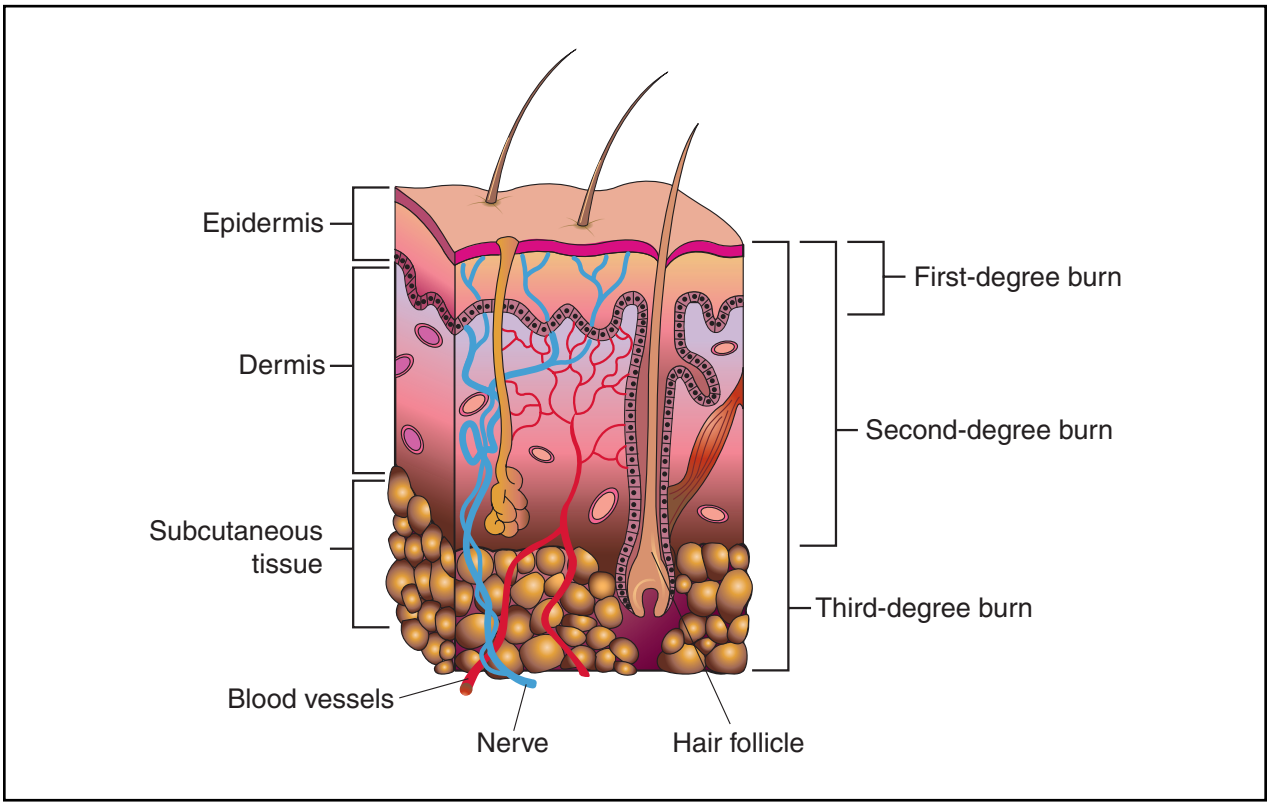
Burns

Definition

Burns are injuries to tissues caused by heat, friction, electricity, radiation, or chemicals.

Description

Burns are characterized by degree, based on the severity of the tissue damage. A first-degree burn causes



There are three classifications of burns: first-degree, second-degree, and third-degree burns. *(Illustration by Electronic Illustrators Group.)*

redness and swelling in the outermost layers of skin (epidermis). A second-degree burn involves redness, swelling and blistering, and the damage may extend beneath the epidermis to deeper layers of skin (dermis). A third-degree burn, also called a full-thickness burn, destroys the entire depth of skin, causing significant scarring. Damage also may extend to the underlying fat, muscle, or bone.

The severity of the burn is also judged by the amount of body surface area (BSA) involved. Health care workers use the "rule of nines" to determine the percentage of BSA affected in patients more than 9 years old: each arm with its hand is 9% of BSA; each leg with its foot is 18%; the front of the torso is 18%; the back of the torso, including the buttocks, is 18%; the head and neck are 9%; and the genital area (perineum) is 1%. This rule cannot be applied to a young child's body proportions, so BSA is estimated using the palm of the patient's hand as a measure of 1% area.

The severity of the burn will determine not only the type of treatment, but also where the burn patient should receive treatment. Minor burns may be treated at home or in a doctor's office. These are defined as first- or second-degree burns covering less than 15% of an adult's body or less than 10% of a child's body, or a third-degree burn on less than 2% BSA. Moderate burns should be treated at a hospital. These are defined as first- or second-degree burns covering 15%-25% of an adult's body or 10%-20% of a child's body, or a third-degree burn on 2%-10% BSA. Critical, or major, burns are the most serious and should be treated in a specialized burn unit of a hospital. These are defined as first- or second-degree burns covering more than 25% of an adult's body or more than 20% of a child's body, or a third-degree burn on more than 10% BSA. In addition, burns involving the hands, feet, face, eyes, ears, or genitals are considered critical. Other factors influence the level of treatment needed, including associated injuries such as bone **fractures** and **smoke inhalation**, presence of a chronic disease, or a history of being abused. Also, children and the elderly are more vulnerable to complications from burn injuries and require more intensive care.

Causes and symptoms

Burns may be caused by even a brief encounter with heat greater than 120°F (49°C). The source of this heat may be the sun (causing a **sunburn**), hot liquids, steam, fire, electricity, friction (causing rug burns and rope burns), and chemicals (causing a caustic burn upon contact).

Classification Of Burns

First-Degree (Minor)	The burned area is painful. The outer skin is reddened. Slight swelling is present.
Second-Degree (Moderate)	The burned area is painful. The underskin is affected. Blisters may form. The area may have a wet, shiny appearance because of exposed tissue.
Third-Degree (Critical)	The burned area is insensitive due to the destruction of nerve endings. Skin is destroyed.Muscle tissues and bone underneath may be damaged. The area may be charred, white, or grayish in color.

Signs of a burn are localized redness, swelling, and **pain**. A severe burn will also blister. The skin may also peel, appear white or charred, and feel numb. A burn may trigger a **headache** and **fever**. Extensive burns may induce **shock**, the symptoms of which are faintness, weakness, rapid pulse and breathing, pale and clammy skin, and bluish lips and fingernails.

Diagnosis

A physician will diagnose a burn based upon visual examination, and will also ask the patient or family members questions to determine the best treatment. He or she may also check for smoke inhalation, **carbon monoxide poisoning**, cyanide **poisoning**, other event-related trauma, or, if suspected, further evidence of **child abuse**.

Treatment

Burn treatment consists of relieving pain, preventing infection, and maintaining body fluids, electrolytes, and calorie intake while the body heals. Treatment of chemical or electrical burns is slightly different from the treatment of thermal burns but the objectives are the same.

Thermal burn treatment

The first act of thermal burn treatment is to stop the burning process. This may be accomplished by letting cool water run over the burned area or by soaking it in cool (not cold) water. Ice should never be applied to the burn. Cool (not cold) wet compresses may provide some pain relief when applied to small areas of first- and second-degree burns. Butter, shortening, or similar salve should never be applied to the burn since it prevents heat from escaping and drives the burning process deeper into the skin.

If the burn is minor, it may be cleaned gently with soap and water. Blisters should not be broken. If the skin of the burned area is unbroken and it is not likely to be further irritated by pressure or friction, the burn should be left exposed to the air to promote healing. If the skin is broken or apt to be disturbed, the burned area should be coated lightly with an antibacterial ointment and covered with a sterile bandage. **Aspirin**, **acetaminophen** (Tylenol), or ibuprofen (Advil) may be taken to ease pain and relieve inflammation. A doctor should be consulted if these signs of infection appear: increased warmth, redness, pain, or swelling; pus or similar drainage from the wound; swollen lymph nodes; or red streaks spreading away from the burn.

In situations where a person has received moderate or critical burns, lifesaving measures take precedence over burn treatment and emergency medical assistance must be called. A person with serious burns may stop breathing, and artificial respiration (also called mouth-to-mouth resuscitation or rescue breathing) should be administered immediately. Also, a person with burns covering more than 12% BSA is likely to go into shock; this condition may be prevented by laying the person flat and elevating the feet about 12 in (30 cm). Burned arms and hands should also be raised higher than the person's heart.

In rescues, a blanket may be used to smother any flames as the person is removed from danger. The person whose clothing is on fire should "stop, drop, and roll" or be assisted in lying flat on the ground and rolling to put out the fire. Afterwards, only burnt clothing that comes off easily should be removed; any clothing embedded in the burn should not be disturbed. Removing any smoldering apparel and covering the person with a light, cool, wet cloth, such as a sheet but not a blanket or towel, will stop the burning process.

At the hospital, the staff will provide further medical treatment. A tube to aid breathing may be inserted if the patient's airways or lungs have been damaged, as can happen during an explosion or a fire in a enclosed space. Also, because burns dramatically deplete the body of fluids, replacement fluids are administered intravenously. The patient is also given **antibiotics** intravenously to prevent infection, and he or she may also receive a **tetanus** shot, depending on his or her immunization history. Once the burned area is cleaned and treated with antibiotic cream or ointment, it is covered in sterile bandages, which are changed two to three times a day. Surgical removal of dead tissue (**debridement**) also takes place. As the burns heal, thick, taut scabs (eschar) form, which the doctor may have to cut to improve blood flow to the more elastic healthy tissue beneath. The patient will also undergo physical and

occupational therapy to keep the burned areas from becoming inflexible and to minimize scarring.

In cases where the skin has been so damaged that it cannot properly heal, a skin graft is usually performed. A skin graft involves taking a piece of skin from an unburned portion of the patient's body (autograft) and transplanting it to the burned area. When doctors cannot immediately use the patient's own skin, a temporary graft is performed using the skin of a human donor (allograft), either alive or dead, or the skin of an animal (xenograft), usually that of a pig.

The burn victim also may be placed in a hyperbaric chamber, if one is available. In a hyperbaric chamber (which can be a specialized room or enclosed space), the patient is exposed to pure oxygen under high pressure, which can aid in healing. However, for this therapy to be effective, the patient must be placed in a chamber within 24 hours of being burned.

Chemical burn treatment

Burns from liquid chemicals must be rinsed with cool water for at least 15 minutes to stop the burning process. Any burn to the eye must be similarly flushed with water. In cases of burns from dry chemicals such as lime, the powder should be completely brushed away before the area is washed. Any clothing which may have absorbed the chemical should be removed. The burn should then be loosely covered with a sterile gauze pad and the person taken to the hospital for further treatment. A physician may be able to neutralize the offending chemical with another before treating the burn like a thermal burn of similar severity.

Electrical burn treatment

Before electrical burns are treated at the site of the accident, the power source must be disconnected if possible and the victim moved away from it to keep the person giving aid from being electrocuted. Lifesaving measures again take priority over burn treatment, so breathing must be checked and assisted if necessary. Electrical burns should be loosely covered with sterile gauze pads and the person taken to the hospital for further treatment.

Alternative treatment

In addition to the excellent treatment of burns provided by traditional medicine, some alternative approaches may be helpful as well. (Major burns should always be treated by a medical practitioner.) The homeopathic remedies *Cantharis* and *Causticum* can assist in burn healing. A number of botanical remedies, applied topically, can also help burns heal. These include aloe (*Aloe barbadensis*), oil of St.-John's-wort (*Hypericum perforatum*), calendula (*Calendula officinalis*), comfrey (*Symphytum officinale*), and tea tree oil (*Melaleuca* spp.). Supplementing the diet with vitamin C, vitamin E, and zinc also is beneficial for wound healing.

KEY TERMS

Debridement—The surgical removal of dead tissue.

Dermis—The basal layer of skin; it contains blood and lymphatic vessels, nerves, glands, and hair follicles.

Epidermis—The outer portion of skin, made up of four or five superficial layers.

Shock—An abnormal condition resulting from low blood volume due to hemorrhage or dehydration. Signs of shock include rapid pulse and breathing, and cool, moist, pale skin.

Prognosis

The prognosis is dependent upon the degree of the burn, the amount of body surface covered, whether critical body parts were affected, any additional injuries or complications like infection, and the promptness of medical treatment. Minor burns may heal in five to 10 days with no scarring. Moderate burns may heal in 10-14 days and may leave scarring. Critical or major burns take more than 14 days to heal and will leave significant scarring. Scar tissue may limit mobility and functionality, but physical therapy may overcome these limitations. In some cases, additional surgery may be advisable to remove scar tissue and restore appearance.

Prevention

Burns are commonly received in residential fires. Properly placed and working smoke detectors in combination with rapid evacuation plans will minimize a person's exposure to smoke and flames in the event of a fire. Children must be taught never to play with matches, lighters, fireworks, gasoline, and cleaning fluids.

Burns by scalding with hot water or other liquids may be prevented by setting the water heater thermostat no higher than 120°F (49°C), checking the temperature of bath water before getting into the tub, and turning pot handles on the stove out of the reach of children. Care should be used when removing covers from pans of

steaming foods and when uncovering or opening foods heated in a microwave oven.

Thermal burns are often received from electrical appliances. Care should be exercised around stoves, space heaters, irons, and curling irons.

Sunburns may be avoided by the liberal use of a sunscreen containing either an opaque active ingredient such as zinc oxide or titanium dioxide or a nonopaque active ingredient such as PABA (para-aminobenzoic acid) or benzophenone. Hats, loose clothing, and umbrellas also provide protection, especially between 10 A.M. and 3 P.M. when the most damaging ultraviolet rays are present in direct sunlight.

Electrical burns may be prevented by covering unused electrical outlets with safety plugs and keeping electrical cords away from infants and toddlers who might chew on them. Persons should also seek shelter indoors during a thunderstorm to avoid being struck by lightning.

Chemical burns may be prevented by wearing protective clothing, including gloves and eyeshields. Chemical agents should always be used according to the manufacturer's instructions and properly stored when not in use.

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The Merck Manual of Diagnosis and Therapy. 17th ed. Ed. Robert Berkow. Rahway, NJ: Merck Research Laboratories, 1997.

ORGANIZATIONS

Shriners Hospitals for Children. 2900 Rocky Point Drive, Tampa, FL 33607-1435. (813) 281-0300. <http://www.shrinershq.org>.

OTHER

HealthAnswers.com. <http://www.healthanswers.com>.

Bethany Thivierge

Bursitis

Definition

Bursitis is the painful inflammation of the bursa, a padlike sac found in areas subject to friction. Bursae cushion the movement between the bones, tendons and muscles near the joints. Bursitis is most often caused by repetitive movement and is known by several common names including weaver's bottom, clergyman's knee, and miner's elbow, depending on the affected individual's occupation and area of injury.

Description

There are over 150 bursae in the human body. Usually bursae are present from birth, but they may form in response to repeated pressure. Each sac contains a small amount of *synovial fluid,* a clear liquid that acts as a lubricant. Inflammation causes **pain** on movement. The most common site for bursitis to occur is the shoulder (subdeltoid), but it also is seen in the elbows (olecranon), hips (trochanteric), knees, heels (Achilles), and toes. The affected area may be referred to as "frozen," because movement is so limited. In the knee there are four bursae, and all can become inflamed with overuse.

Causes and symptoms

The most common cause of bursitis is repeated physical activity, but it can flare up for no known reason. It can also be caused by trauma, **rheumatoid arthritis**, **gout**, and acute or chronic infection.

Pain and tenderness are common symptoms. If the affected joint is close to the skin, as with the shoulder, knee, elbow, or Achilles tendon, swelling and redness are seen and the area may feel warm to the touch. The bursae around the hip joint are deeper, and swelling is not obvious. Movement may be limited and is painful. In the shoulder, it may be difficult to raise the arm out from the side of the body. Putting on a jacket or combing the hair becomes a troublesome activity.

In acute bursitis symptoms appear suddenly; with chronic bursitis, pain, tenderness, and limited movement reappear after **exercise** or strain.

Diagnosis

When a patient has pain in a joint, a careful **physical examination** is needed to determine what type of movement is affected and if there is any swelling present. Bursitis will not show up on x-rays, although sometimes there are also calcium deposits in the joint that can be seen. Inserting a thin needle into the affected bursa and removing (aspirating) some of the synovial fluid for examination can confirm the diagnosis. In most cases, the fluid will not be clear. It can be tested for the presence of microorganisms, which would indicate an infection, and crystals, which could indicate gout. In instances where the diagnosis is difficult, a local anesthetic (a drug that numbs the area) is injected into the painful spot. If the discomfort stops temporarily, then bursitis is probably the correct diagnosis.

Treatment

Conservative treatment of bursitis is usually effective. The application of heat, rest, and **immobilization** of

the affected joint area is the first step. A sling can be used for a shoulder injury; a cane is helpful for hip problems. The patient can take **nonsteroidal anti-inflammatory drugs** (NSAIDs) like **aspirin**, ibuprofin, and naproxen. They can be obtained without a prescription and relieve the pain and inflammation. Once the pain decreases, exercises of the affected area can begin. If the nearby muscles have become weak because of the disease or prolonged immobility, then exercises to build strength and improve movement are best. A doctor or physical therapist can prescribe an effective regimen.

If the bursitis is related to an inflammatory condition like arthritis or gout, then management of that disease is needed to control the bursitis.

When bursitis does not respond to conservative treatment, an injection into the joint of a long-acting corticosteroid preparation, like prednisone, can bring immediate and lasting relief. A corticosteroid is a hormonal substance that is the most effective drug for reducing inflammation. The drug is mixed with a local anesthetic and works on the joint within five minutes. Usually one injection is all that is needed.

Surgery to remove the damaged bursa may be performed in extreme cases.

If the bursitis is caused by an infection, then additional treatment is needed. *Septic* bursitis is caused by the presence of a pus-forming organism, usually *staphylococcus aureus*. This is confirmed by examining a sample of the fluid in the bursa and requires treatment with **antibiotics** taken by mouth, injected into a muscle or into a vein (intravenously). The bursa will also need to be drained by needle two or three times over the first week of treatment. When a patient has such a serious infection, there may be underlying causes. There could be undiscovered diabetes, or an inefficient immune system caused by human **immunodeficiency** virus infection (HIV).

Alternative treatment

Alternative treatments take into consideration the role of diet in causing bursitis. The faulty use of calcium by the body, magnesium deficiency, and food **allergies** may have a role. Diet changes and vitamin supplements may be helpful. The use of herbs, **homeopathy**, **aromatherapy**, and **hydrotherapy** can help relieve symptoms. Ginger is useful in reducing inflammation. **Acupuncture** has been proven effective in treating hip and shoulder pain caused by bursitis and other conditions. Other therapies that deal effectively with musculoskeletal problems (relating to the muscles and skeleton), may also be helpful, such as body work, **magnetic field therapy**, **naturopathic medicine**, **chiropractic**, and **applied kinesiology**.

KEY TERMS

Arthritis—Inflammation of a joint that may lead to changes in the joint's structure. It causes pain and swelling. Rheumatoid arthritis is a chronic disease that leads to crippling deformities.

Diabetes mellitus—A metabolic disease caused by a deficiency of insulin, which is essential to process carbohydrates in the body.

Gout—A hereditary metabolic disease that is a form of arthritis and causes inflammation of the joints. It is more common in men.

Inflammation—The reaction of tissue to injury.

Kinesiology—The science or study of movement.

Prognosis

Bursitis usually responds well to treatment, but it may develop into a chronic condition if the underlying cause is not corrected.

Prevention

Aggravating factors should be eliminated to prevent bursitis. Overexercising or the repetition of a movement that triggers the condition should be avoided. Doing exercises to strengthen the muscles around the joint will also help. When doing repetitive tasks, frequent breaks should be taken and the activity should be alternated with others using different parts of the body. To cushion the joints, it is a good idea to use cushioned chairs when sitting and foam kneeling pads for the knees. Leaning on the elbows, kneeling or sitting on a hard surface for a long period of time should be avoided. Not wearing high heels can help prevent bursitis in the heel, as can changing to new running shoes as soon as the old ones are worn out.

Resources

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Bypass surgery *see* **Coronary artery bypass graft surgery**

Byssinosis

Definition

Byssinosis is a chronic, asthma-like narrowing of the airways. Also called brown lung disease, byssinosis results from inhaling particles of cotton, flax, hemp, or jute.

Description

Although inhaling cotton dust was identified as a source of respiratory disease more than 300 years ago, byssinosis has been recognized as an occupational hazard for textile workers for less than 50 years. More than 800,000 workers in the cotton, flax, and rope-making industries are exposed in the workplace to airborne particles that can cause byssinosis. Only workers in mills that manufacture yarn, thread, or fabric have a significant risk of dying of this disease.

In the United States, byssinosis is almost completely limited to workers who handle unprocessed cotton. More than 35,000 textile workers have been disabled by byssinosis and 183 died between 1979 and 1992. Most of the people whose deaths were due to byssinosis lived in the textile-producing regions of North and South Carolina.

Causes and symptoms

Wheezing, **shortness of breath**, and a feeling of tightness in the chest occur occasionally during the early stages of the disease. Symptoms are usually more pronounced when returning to work after a weekend, holiday, or vacation and subside as the worker becomes reaccustomed to the environment.

As many as 25% of workers with byssinosis have symptoms that continue or recur throughout the workweek. More severe breathing problems seem to result both from exposure to high levels of dust and from longer dust exposure. Workers who also smoke cigarettes suffer the most severe impairment.

KEY TERMS

Wheeze—A whistling sound made by the flow of high-velocity air through narrowed airways. Wheezing is a symptom of several respiratory diseases including byssinosis and asthma.

Diagnosis

Tests that detect decreasing lung capacity during the workday are used to diagnose byssinosis. Obstructive patterns are likely in patients who have had recurrent symptoms for more than 10 years.

Treatment

Therapy for early-stage byssinosis focuses on reversing airway narrowing. **Antihistamines** may be prescribed to reduce tightness in the chest. **Bronchodilators** (drugs used to relax breathing passages and improve air flow) may be used with an inhaler or taken in tablet form. Reducing exposure is essential. Any worker who has symptoms of byssinosis or who has trouble breathing should transfer to a less-contaminated area.

Prognosis

Smoking, impaired lung function, and a history of respiratory allergy increase a textile worker's risk of developing byssinosis. Prolonged exposure makes patients wheeze more often and can cause chronic **bronchitis**. It does not lead to permanently disabling lung disease.

Prevention

Eliminating exposure to textile dust is the surest way to prevent byssinosis. Using exhaust hoods, improving ventilation, and employing wetting procedures are very successful methods of controlling dust levels to prevent byssinosis. Protective equipment required during certain procedures also prevents exposure to levels of contamination that exceed the current United States standard for cotton dust exposure.

Resources

BOOKS
Harrison's Principles of Internal Medicine. Ed. Anthony S. Fauci, et al. New York: McGraw-Hill, 1997.
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ORGANIZATIONS

American Lung Association. 1740 Broadway, New York, NY 10019. (800) 586-4872. <http://www.lungusa.org>.

Centers for Disease Control and Prevention. 1600 Clifton Rd., NE, Atlanta, GA 30333. (800) 311-3435, (404) 639-3311. <http://www.cdc.gov>.

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