

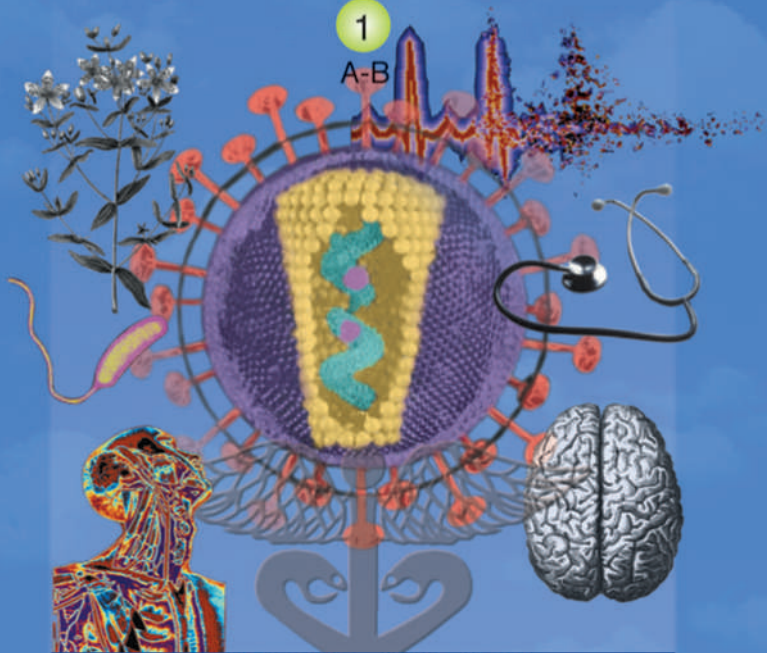
The GALE ENCYCLOPEDIA *of* MEDICINE

SECOND EDITION

VOLUME

1

A-B



JACQUELINE L. LONGE, EDITOR

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GALE GROUP



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PLEASE READ—IMPORTANT INFORMATION

The *Gale Encyclopedia of Medicine 2* is a medical reference product designed to inform and educate readers about a wide variety of disorders, conditions, treatments, and diagnostic tests. The Gale Group believes the product to be comprehensive, but not necessarily definitive. It is intended to supplement, not replace, consultation with a physician or other healthcare practitioner. While the Gale Group has made substantial efforts to provide information that is accurate, comprehensive, and up-to-date, the Gale Group makes no representations or warranties of any

kind, including without limitation, warranties of merchantability or fitness for a particular purpose, nor does it guarantee the accuracy, comprehensiveness, or timeliness of the information contained in this product. Readers should be aware that the universe of medical knowledge is constantly growing and changing, and that differences of medical opinion exist among authorities. Readers are also advised to seek professional diagnosis and treatment for any medical condition, and to discuss information obtained from this book with their health care provider.

INTRODUCTION

The *Gale Encyclopedia of Medicine 2 (GEM2)* is a one-stop source for medical information on nearly 1,700 common medical disorders, conditions, tests, and treatments, including high-profile diseases such as AIDS, Alzheimer's disease, cancer, and heart attack. This encyclopedia avoids medical jargon and uses language that laypersons can understand, while still providing thorough coverage of each topic. The *Gale Encyclopedia of Medicine 2* fills a gap between basic consumer health resources, such as single-volume family medical guides, and highly technical professional materials.

SCOPE

Almost 1,700 full-length articles are included in the *Gale Encyclopedia of Medicine 2*, including disorders/conditions, tests/procedures, and treatments/therapies. Many common drugs are also covered, with generic drug names appearing first and brand names following in parentheses, eg. acetaminophen (Tylenol). Throughout the *Gale Encyclopedia of Medicine 2*, many prominent individuals are highlighted as sidebar biographies that accompany the main topical essays. Articles follow a standardized format that provides information at a glance. Rubrics include:

Disorders/Conditions	Tests/Treatments
Definition	Definition
Description	Purpose
Causes and symptoms	Precautions
Diagnosis	Description
Treatment	Preparation
Alternative treatment	Aftercare
Prognosis	Risks
Prevention	Normal/Abnormal results
Resources	Resources
Key terms	Key terms

In recent years there has been a resurgence of interest in holistic medicine that emphasizes the connection between mind and body. Aimed at achieving and maintaining good health rather than just eliminating disease,

this approach has come to be known as alternative medicine. The *Gale Encyclopedia of Medicine 2* includes a number of essays on alternative therapies, ranging from traditional Chinese medicine to homeopathy and from meditation to aromatherapy. In addition to full essays on alternative therapies, the encyclopedia features specific **Alternative treatment** sections for diseases and conditions that may be helped by complementary therapies.

INCLUSION CRITERIA

A preliminary list of diseases, disorders, tests and treatments was compiled from a wide variety of sources, including professional medical guides and textbooks as well as consumer guides and encyclopedias. The general advisory board, made up of public librarians, medical librarians and consumer health experts, evaluated the topics and made suggestions for inclusion. The list was sorted by category and sent to *GEM2* medical advisors, certified physicians with various medical specialties, for review. Final selection of topics to include was made by the medical advisors in conjunction with the Gale Group editor.

ABOUT THE CONTRIBUTORS

The essays were compiled by experienced medical writers, including physicians, pharmacists, nurses, and other health care professionals. *GEM2* medical advisors reviewed the completed essays to insure that they are appropriate, up-to-date, and medically accurate.

HOW TO USE THIS BOOK

The *Gale Encyclopedia of Medicine 2* has been designed with ready reference in mind.

- Straight **alphabetical arrangement** allows users to locate information quickly.
- Bold-faced terms function as **print hyperlinks** that point the reader to related entries in the encyclopedia.

KEY TERMS

Multi-fetal pregnancy—A pregnancy of two or more fetuses.

Selective reduction—Typically referred to in cases of multifetal pregnancy, when one or more fetuses are aborted to preserve the viability of the remaining fetuses and decrease health risks to the mother.

ORGANIZATIONS

The American Society for Reproductive Medicine. 1209 Montgomery Highway, Birmingham, AL 35216-2809. (205) 978-5000. <<http://www.asrm.org>>.

The Alan Guttmacher Institute. 120 Wall Street, New York, NY 10005. (212) 248-1111. <<http://www.agi-usa.org>>.

Meghan M. Gourley

Abortion, spontaneous see **Miscarriage**

Abortion, therapeutic

Definition

Therapeutic abortion is the intentional termination of a **pregnancy** before the fetus can live independently. Abortion has been a legal procedure in the United States since 1973.

Purpose

An abortion may be performed whenever there is some compelling reason to end a pregnancy. Women have abortions because continuing the pregnancy would cause them hardship, endanger their life or health, or because prenatal testing has shown that the fetus will be born with severe abnormalities.

Abortions are safest when performed within the first six to 10 weeks after the last menstrual period. The calculation of this date is referred to as the gestational age and is used in determining the stage of pregnancy. For example, a woman who is two weeks late having her period is said to be six weeks pregnant, because it is six weeks since she last menstruated.

About 90% of women who have abortions do so before 13 weeks and experience few complications. Abortions performed between 13-24 weeks have a higher

rate of complications. Abortions after 24 weeks are extremely rare and are usually limited to situations where the life of the mother is in danger.

Precautions

Most women are able to have abortions at clinics or outpatient facilities if the procedure is performed early in pregnancy. Women who have stable diabetes, controlled epilepsy, mild to moderate high blood pressure, or who are HIV positive can often have abortions as outpatients if precautions are taken. Women with heart disease, previous **endocarditis**, **asthma**, lupus erythematosus, uterine fibroid tumors, blood clotting disorders, poorly controlled epilepsy, or some psychological disorders usually need to be hospitalized in order to receive special monitoring and medications during the procedure.

Description

Very early abortions

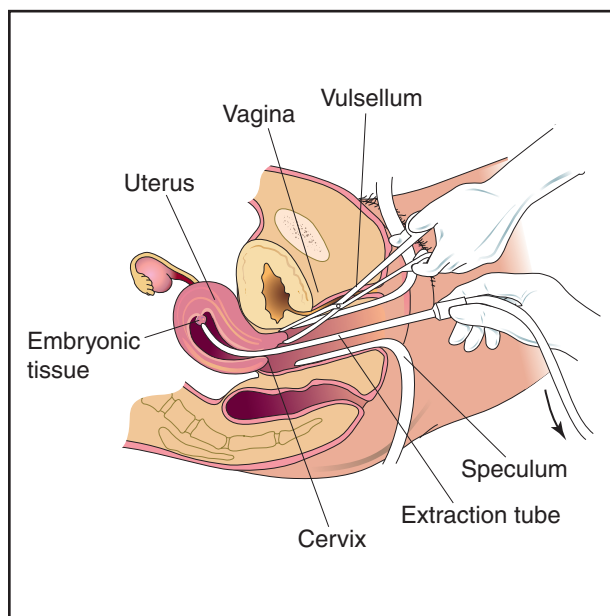
Between five and seven weeks, a pregnancy can be ended by a procedure called menstrual extraction. This procedure is also sometimes called menstrual regulation, mini-suction, or preemptive abortion. The contents of the uterus are suctioned out through a thin (3-4 mm) plastic tube that is inserted through the undilated cervix. Suction is applied either by a bulb syringe or a small pump.

Another method is called the “morning after” pill, or emergency **contraception**. Basically, it involves taking high doses of birth control pills within 24 to 48 hours of having unprotected sex. The high doses of hormones causes the uterine lining to change so that it will not support a pregnancy. Thus, if the egg has been fertilized, it is simply expelled from the body.

There are two types of emergency contraception. One type is identical to ordinary birth control pills, and uses the hormones estrogen and progestin. This type is available with a prescription under the brand name Preven. But women can even use their regular birth control pills for emergency contraception, after they check with their doctor about the proper dose. About half of women who use birth control pills for emergency contraception get nauseated and 20 percent vomit. This method cuts the risk of pregnancy 75 percent.

The other type of morning-after pill contains only one hormone: progestin, and is available under the brand name Plan B. It is more effective than the first type with a lower risk of **nausea and vomiting**. It reduces the risk of pregnancy 89 percent.

Women should check with their physicians regarding the proper dose of pills to take, as it depends on the



Between 5 and 7 weeks, a pregnancy can be ended by a procedure called menstrual extraction. The contents of the uterus are suctioned out through a thin extraction tube that is inserted through the undilated cervix. (Illustration by Electronic Illustrators Group.)

brand of birth control pill. Not all birth control pills will work for emergency contraception.

Menstrual extractions are safe, but because the amount of fetal material is so small at this stage of development, it is easy to miss. This results in an incomplete abortion that means the pregnancy continues.

First trimester abortions

The first trimester of pregnancy includes the first 13 weeks after the last menstrual period. In the United States, about 90% of abortions are performed during this period. It is the safest time in which to have an abortion, and the time in which women have the most choice of how the procedure is performed.

MEDICAL ABORTIONS. Medical abortions are brought about by taking medications that end the pregnancy. The advantages of a first trimester medical abortion are:

- The procedure is non-invasive; no surgical instruments are used.
- Anesthesia is not required.
- Drugs are administered either orally or by injection.
- The procedure resembles a natural **miscarriage**.

Disadvantages of a medical abortion are:

- The effectiveness decreases after the seventh week.

- The procedure may require multiple visits to the doctor.
- Bleeding after the abortion lasts longer than after a surgical abortion.
- The woman may see the contents of her womb as it is expelled.

Two different medications can be used to bring about an abortion. Methotrexate (Rheumatrex) works by stopping fetal cells from dividing which causes the fetus to die.

On the first visit to the doctor, the woman receives an injection of methotrexate. On the second visit, about a week later, she is given misoprostol (Cytotec), an oxygenated unsaturated cyclic fatty acid responsible for various hormonal reactions such as muscle contraction (prostaglandin), that stimulates contractions of the uterus. Within two weeks, the woman will expel the contents of her uterus, ending the pregnancy. A follow-up visit to the doctor is necessary to assure that the abortion is complete.

With this procedure, a woman will feel cramping and may feel nauseated from the misoprostol. This combination of drugs is 90-96% effective in ending pregnancy.

Mifepristone (RU-486), which goes by the brand name Mifeprex, works by blocking the action of progesterone, a hormone needed for pregnancy to continue, then stimulates uterine contractions thus ending the pregnancy. It can be taken as much as 49 days after the first day of a woman's last period. On the first visit to the doctor, a woman takes a mifepristone pill. Two days later she returns and, if the miscarriage has not occurred, takes two misoprostol pills, which causes the uterus to contract. Five percent of women won't need to take misoprostol. After an observation period, she returns home.

Within four days, 90% of women have expelled the contents of their uterus and completed the abortion. Within 14 days, 95-97% of women have completed the abortion. A third follow-up visit to the doctor is necessary to confirm through observation or ultrasound that the procedure is complete. In the event that it is not, a surgical abortion is performed. Studies show that 4.5 to 8 percent of women need surgery or a blood **transfusion** after taking mifepristone, and the pregnancy persists in about 1 percent of women. In this case, surgical abortion is recommended because the fetus may be damaged. Side effects include nausea, vaginal bleeding and heavy cramping. The bleeding is typically heavier than a normal period and may last up to 16 days.

Mifepristone is not recommended for women with **ectopic pregnancy**, an **IUD**, who have been taking long-

term steroidal therapy, have bleeding abnormalities or on blood-thinners such as Coumadin.

Surgical abortions

First trimester surgical abortions are performed using vacuum aspiration. The procedure is also called dilation and evacuation (D & E), suction dilation, vacuum curettage, or suction curettage.

Advantages of a vacuum aspiration abortion are:

- It is usually done as a one-day outpatient procedure.
- The procedure takes only 10-15 minutes.
- Bleeding after the abortion lasts five days or less.
- The woman does not see the products of her womb being removed.

Disadvantages include:

- The procedure is invasive; surgical instruments are used.
- Infection may occur.

During a vacuum aspiration, the woman's cervix is gradually dilated by expanding rods inserted into the cervical opening. Once dilated, a tube attached to a suction pump is inserted through the cervix and the contents of the uterus are suctioned out. The procedure is 97-99% effective. The amount of discomfort a woman feels varies considerably. Local anesthesia is often given to numb the cervix, but it does not mask uterine cramping. After a few hours of rest, the woman may return home.

Second trimester abortions

Although it is better to have an abortion during the first trimester, some second trimester abortions may be inevitable. The results of **genetic testing** are often not available until 16 weeks. In addition, women, especially teens, may not have recognized the pregnancy or come to terms with it emotionally soon enough to have a first trimester abortion. Teens make up the largest group having second trimester abortions.

Some second trimester abortions are performed as a D & E. The procedures are similar to those used in the first trimester, but a larger suction tube must be used because more material must be removed. This increases the amount of cervical dilation necessary and increases the risk of the procedure. Many physicians are reluctant to perform a D & E this late in pregnancy, and for some women it is not a medically safe option.

The alternative to a D & E in the second trimester is an abortion by induced labor. Induced labor may require an overnight stay in a hospital. The day before the procedure, the woman visits the doctor for tests, and to either

KEY TERMS

Endocarditis—An infection of the inner membrane lining of the heart.

Fibroid tumors—Fibroid tumors are non-cancerous (benign) growths in the uterus. They occur in 30-40% of women over age 40, and do not need to be removed unless they are causing symptoms that interfere with a woman's normal activities.

Lupus erythematosus—A chronic inflammatory disease in which inappropriate immune system reactions cause abnormalities in the blood vessels and connective tissue.

Prostaglandin—Oxygenated unsaturated cyclic fatty acids responsible for various hormonal reactions such as muscle contraction.

Rh negative—Lacking the Rh factor, genetically determined antigens in red blood cells that produce immune responses. If an Rh negative woman is pregnant with an Rh positive fetus, her body will produce antibodies against the fetus's blood, causing a disease known as Rh disease. Sensitization to the disease occurs when the woman's blood is exposed to the fetus's blood. Rh immune globulin (RhoGAM) is a vaccine that must be given to a woman after an abortion, miscarriage, or prenatal tests in order to prevent sensitization to Rh disease.

have rods inserted in her cervix to help dilate it or to receive medication that will soften the cervix and speed up labor.

On the day of the abortion, drugs, usually prostaglandins to induce contractions, and a salt water solution, are injected into the uterus. Contractions begin, and within eight to 72 hours the woman delivers the fetus.

Side effects of this procedure include nausea, vomiting, and **diarrhea** from the prostaglandins, and **pain** from uterine cramps. Anesthesia of the sort used in **childbirth** can be given to mask the pain. Many women are able to go home a few hours after the procedure.

Very early abortions cost between \$200-\$400. Later abortions cost more. The cost increases about \$100 per week between the thirteenth and sixteenth week. Second trimester abortions are much more costly because they often involve more risk, more services, anesthesia, and sometimes a hospital stay. Insurance carriers and HMOs may or may not cover the procedure. Federal law pro-

hibits federal funds including Medicaid funds, from being used to pay for an elective abortion.

Preparation

The doctor must know accurately the stage of a woman's pregnancy before an abortion is performed. The doctor will ask the woman questions about her menstrual cycle and also do a **physical examination** to confirm the stage of pregnancy. This may be done at an office visit before the abortion or on the day of the abortion. Some states require a waiting period before an abortion can be performed. Others require parental or court consent for a child under age 18 to receive an abortion.

Despite the fact that almost half of all women in the United States have had at least one abortion by the time they reach age 45, abortion is surrounded by controversy. Women often find themselves in emotional turmoil when deciding if an abortion is a procedure they wish to undergo. Pre-abortion counseling is important in helping a woman resolve any questions she may have about having the procedure.

Aftercare

Regardless of the method used to perform the abortion, a woman will be observed for a period of time to make sure her blood pressure is stable and that bleeding is controlled. The doctor may prescribe **antibiotics** to reduce the chance of infection. Women who are Rh negative (lacking genetically determined antigens in their red blood cells that produce immune responses) should be given a human Rh immune globulin (RhoGAM) after the procedure unless the father of the fetus is also Rh negative. This prevents blood incompatibility complications in future pregnancies.

Bleeding will continue for about five days in a surgical abortion and longer in a medical abortion. To decrease the risk of infection, a woman should avoid intercourse and not use tampons and douches for two weeks after the abortion.

A follow-up visit is a necessary part of the woman's aftercare. Contraception will be offered to women who wish to avoid future pregnancies, because menstrual periods normally resume within a few weeks.

Risks

Serious complications resulting from abortions performed before 13 weeks are rare. Of the 90% of women who have abortions in this time period, 2.5% have minor complications that can be handled without hospitalization. Less than 0.5% have complications that require a hospital stay. The rate of complications increases as the pregnancy progresses.

Complications from abortions can include:

- uncontrolled bleeding
- infection
- blood clots accumulating in the uterus
- a tear in the cervix or uterus
- missed abortion where the pregnancy continues
- incomplete abortion where some material from the pregnancy remains in the uterus

Women who experience any of the following symptoms of post-abortion complications should call the clinic or doctor who performed the abortion immediately.

- severe pain
- fever over 100.4°F (38.2°C)
- heavy bleeding that soaks through more than one sanitary pad per hour
- foul-smelling discharge from the vagina
- continuing symptoms of pregnancy

Normal results

Usually the pregnancy is ended without complication and without altering future fertility.

Resources

BOOKS

Carlson, Karen J., Stephanie A. Eisenstat, and Terra Ziporyn. "Abortion." In *The Harvard Guide to Women's Health*. Cambridge, MA: Harvard University Press, 1996.

DeCherney, Alan H., and Martin L. Peroll. "Contraception and Family Planning." In *Current Obstetric and Gynecologic Diagnosis and Treatment*. Norwalk, CT: Appleton & Lange, 1994.

ORGANIZATION

National Abortion Federation. (800) 772-9100. <<http://www.prochoice.org>>.

Debra Gordon

Abrasions see **Wounds**

Abruptio placentae see **Placental abruption**

Abscess

Definition

An abscess is an enclosed collection of liquefied tissue, known as pus, somewhere in the body. It is the result of the body's defensive reaction to foreign material.

Description

There are two types of abscesses, septic and sterile. Most abscesses are septic, which means that they are the result of an infection. Septic abscesses can occur anywhere in the body. Only a germ and the body's immune response are required. In response to the invading germ, white blood cells gather at the infected site and begin producing chemicals called enzymes that attack the germ by digesting it. These enzymes act like acid, killing the germs and breaking them down into small pieces that can be picked up by the circulation and eliminated from the body. Unfortunately, these chemicals also digest body tissues. In most cases, the germ produces similar chemicals. The result is a thick, yellow liquid—pus—containing digested germs, digested tissue, white blood cells, and enzymes.

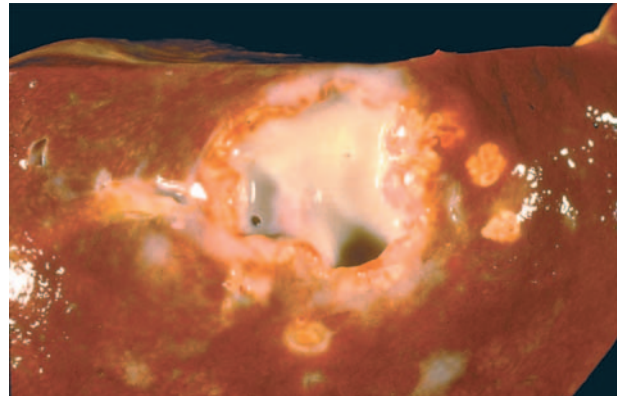
An abscess is the last stage of a tissue infection that begins with a process called inflammation. Initially, as the invading germ activates the body's immune system, several events occur:

- Blood flow to the area increases.
- The temperature of the area increases due to the increased blood supply.
- The area swells due to the accumulation of water, blood, and other liquids.
- It turns red.
- It hurts, because of the irritation from the swelling and the chemical activity.

These four signs—heat, swelling, redness, and pain—characterize inflammation.

As the process progresses, the tissue begins to turn to liquid, and an abscess forms. It is the nature of an abscess to spread as the chemical digestion liquefies more and more tissue. Furthermore, the spreading follows the path of least resistance—the tissues most easily digested. A good example is an abscess just beneath the skin. It most easily continues along beneath the skin rather than working its way through the skin where it could drain its toxic contents. The contents of the abscess also leak into the general circulation and produce symptoms just like any other infection. These include chills, **fever**, aching, and general discomfort.

Sterile abscesses are sometimes a milder form of the same process caused not by germs but by non-living irritants such as drugs. If an injected drug like penicillin is not absorbed, it stays where it was injected and may cause enough irritation to generate a sterile abscess—sterile because there is no infection involved. Sterile abscesses are quite likely to turn into hard, solid lumps as they scar, rather than remaining pockets of pus.



An amoebic abscess caused by *Entamoeba histolytica*.
(Phototake NYC. Reproduced by permission.)

Causes and symptoms

Many different agents cause abscesses. The most common are the pus-forming (pyogenic) bacteria like *Staphylococcus aureus*, which is nearly always the cause of abscesses under the skin. Abscesses near the large bowel, particularly around the anus, may be caused by any of the numerous bacteria found within the large bowel. Brain abscesses and liver abscesses can be caused by any organism that can travel there through the circulation. Bacteria, amoeba, and certain fungi can travel in this fashion. Abscesses in other parts of the body are caused by organisms that normally inhabit nearby structures or that infect them. Some common causes of specific abscesses are:

- skin abscesses by normal skin flora
- dental and throat abscesses by mouth flora
- lung abscesses by normal airway flora, **pneumonia** germs, or **tuberculosis**
- abdominal and anal abscesses by normal bowel flora

Specific types of abscesses

Listed below are some of the more common and important abscesses.

- Carbuncles and other **boils**. Skin oil glands (sebaceous glands) on the back or the back of the neck are the ones usually infected. The most common germ involved is *Staphylococcus aureus*. **Acne** is a similar condition of sebaceous glands on the face and back.
- Pilonidal abscess. Many people have as a birth defect a tiny opening in the skin just above the anus. Fecal bacteria can enter this opening, causing an infection and subsequent abscess.

KEY TERMS

Cellulitis—Inflammation of tissue due to infection.

Enzyme—Any of a number of protein chemicals that can change other chemicals.

Fallopian tubes—Part of the internal female anatomy that carries eggs from the ovaries to the uterus.

Flora—Living inhabitants of a region or area.

Pyogenic—Capable of generating pus. *Streptococcus*, *Staphylococcus*, and bowel bacteria are the primary pyogenic organisms.

Sebaceous glands—Tiny structures in the skin that produce oil (sebum). If they become plugged, sebum collects inside and forms a nurturing place for germs to grow.

Septicemia—The spread of an infectious agent throughout the body by means of the blood stream.

Sinus—A tubular channel connecting one body part with another or with the outside.

- Retropharyngeal, parapharyngeal, peritonsillar abscess. As a result of throat infections like **strep throat** and **tonsillitis**, bacteria can invade the deeper tissues of the throat and cause an abscess. These abscesses can compromise swallowing and even breathing.
- Lung abscess. During or after pneumonia, whether it's due to bacteria [common pneumonia], tuberculosis, fungi, parasites, or other germs, abscesses can develop as a complication.
- Liver abscess. Bacteria or amoeba from the intestines can spread through the blood to the liver and cause abscesses.
- Psoas abscess. Deep in the back of the abdomen on either side of the lumbar spine lie the psoas muscles. They flex the hips. An abscess can develop in one of these muscles, usually when it spreads from the appendix, the large bowel, or the fallopian tubes.

Diagnosis

The common findings of inflammation—heat, redness, swelling, and pain—easily identify superficial abscesses. Abscesses in other places may produce only generalized symptoms such as fever and discomfort. If the patient's symptoms and **physical examination** do not help, a physician may have to resort to a battery of tests to

locate the site of an abscess, but usually something in the initial evaluation directs the search. Recent or chronic disease in an organ suggests it may be the site of an abscess. Dysfunction of an organ or system—for instance, seizures or altered bowel function—may provide the clue. **Pain** and tenderness on physical examination are common findings. Sometimes a deep abscess will eat a small channel (sinus) to the surface and begin leaking pus. A sterile abscess may cause only a painful lump deep in the buttock where a shot was given.

Treatment

Since skin is very resistant to the spread of infection, it acts as a barrier, often keeping the toxic chemicals of an abscess from escaping the body on their own. Thus, the pus must be drained from the abscess by a physician. The surgeon determines when the abscess is ready for drainage and opens a path to the outside, allowing the pus to escape. Ordinarily, the body handles the remaining infection, sometimes with the help of **antibiotics** or other drugs. The surgeon may leave a drain (a piece of cloth or rubber) in the abscess cavity to prevent it from closing before all the pus has drained out.

Alternative treatment

If an abscess is directly beneath the skin, it will be slowly working its way through the skin as it is more rapidly working its way elsewhere. Since chemicals work faster at higher temperatures, applications of hot compresses to the skin over the abscess will hasten the digestion of the skin and eventually result in its breaking down, releasing the pus spontaneously. This treatment is best reserved for smaller abscesses in relatively less dangerous areas of the body—limbs, trunk, back of the neck. It is also useful for all superficial abscesses in their very early stages. It will “ripen” them.

Contrast **hydrotherapy**, alternating hot and cold compresses, can also help assist the body in resorption of the abscess. There are two homeopathic remedies that work to rebalance the body in relation to abscess formation, *Silica* and *Hepar sulphuris*. In cases of septic abscesses, bentonite clay packs (bentonite clay and a small amount of *Hydrastis* powder) can be used to draw the infection from the area.

Prognosis

Once the abscess is properly drained, the prognosis is excellent for the condition itself. The reason for the abscess (other diseases the patient has) will determine the overall outcome. If, on the other hand, the abscess ruptures into neighboring areas or permits the infectious

agent to spill into the bloodstream, serious or fatal consequences are likely. Abscesses in and around the nasal sinuses, face, ears, and scalp may work their way into the brain. Abscesses within an abdominal organ such as the liver may rupture into the abdominal cavity. In either case, the result is life threatening. Blood **poisoning** is a term commonly used to describe an infection that has spilled into the blood stream and spread throughout the body from a localized origin. Blood poisoning, known to physicians as septicemia, is also life threatening.

Of special note, abscesses in the hand are more serious than they might appear. Due to the intricate structure and the overriding importance of the hand, any hand infection must be treated promptly and competently.

Prevention

Infections that are treated early with heat (if superficial) or antibiotics will often resolve without the formation of an abscess. It is even better to avoid infections altogether by taking prompt care of open injuries, particularly puncture **wounds**. Bites are the most dangerous of all, even more so because they often occur on the hand.

Resources

BOOKS

- Bennett, J. Claude, and Fred Plum, eds. *Cecil Textbook of Medicine*. Philadelphia: W. B. Saunders Co., 1996.
- Current Medical Diagnosis and Treatment*, 1996. 35th ed. Ed. Stephen McPhee, et al. Stamford: Appleton & Lange, 1995.
- Harrison's Principles of Internal Medicine*. Ed. Anthony S. Fauci, et al. New York: McGraw-Hill, 1997.

J. Ricker Polsdorfer, MD

Abscess drainage see **Abscess incision and drainage**

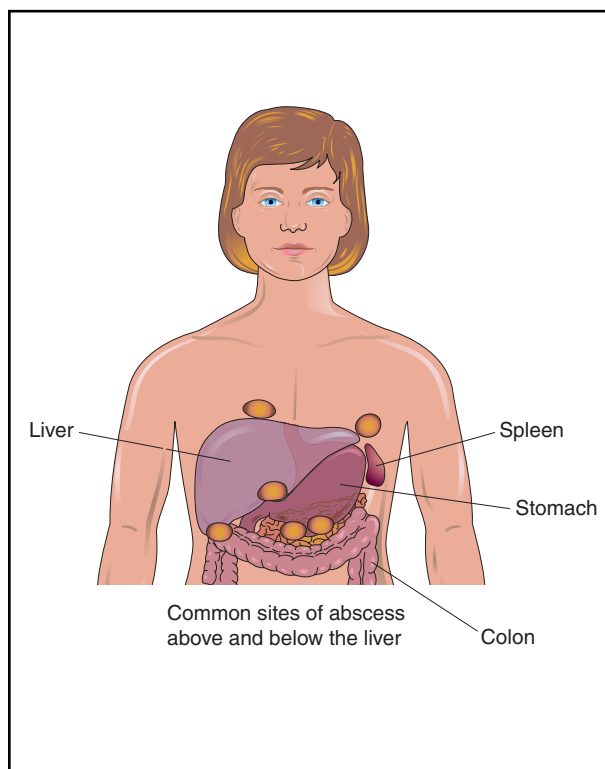
Abscess incision & drainage

Definition

An infected skin nodule that contains pus may need to be drained via a cut if it does not respond to **antibiotics**. This allows the pus to escape, and the infection to heal.

Purpose

An **abscess** is a pus-filled sore, usually caused by a bacterial infection. The pus is made up of both live and dead organisms and destroyed tissue from the white



Although abscesses are often found in the soft tissue under the skin, such as the armpit or the groin, they may develop in any organ, such as the liver. (Illustration by Electronic Illustrators Group.)

blood cells that were carried to the area to fight the infection. Abscesses are often found in the soft tissue under the skin, such as the armpit or the groin. However, they may develop in any organ, and are commonly found in the breast and gums. Abscesses are far more serious and call for more specific treatment if they are located in deep organs such as the lung, liver or brain.

Because the lining of the abscess cavity tends to interfere with the amount of the drug that can penetrate the source of infection from the blood, the cavity itself may require draining. Once an abscess has fully formed, it often does not respond to antibiotics. Even if the antibiotic does penetrate into the abscess, it doesn't function as well in that environment.

Precautions

An abscess can usually be diagnosed visually, although an imaging technique such as a computed tomography scan may be used to confirm the extent of the abscess before drainage. Such procedures may also be needed to localize internal abscesses, such as those in the abdominal cavity or brain.

KEY TERMS

White blood cells—Cells that protect the body against infection.

Description

A doctor will cut into the lining of the abscess, allowing the pus to escape either through a drainage tube or by leaving the cavity open to the skin. How big the incision is depends on how quickly the pus is encountered.

Once the abscess is opened, the doctor will clean and irrigate the wound thoroughly with saline. If it is not too large or deep, the doctor may simply pack the abscess wound with gauze for 24–48 hours to absorb the pus and discharge.

If it is a deeper abscess, the doctor may insert a drainage tube after cleaning out the wound. Once the tube is in place, the surgeon closes the incision with simple stitches, and applies a sterile dressing. Drainage is maintained for several days to help prevent the abscess from reforming.

Preparation

The skin over the abscess will be cleansed by swabbing gently with an antiseptic solution.

Aftercare

Much of the **pain** around the abscess will be gone after the surgery. Healing is usually very fast. After the tube is taken out, antibiotics may be continued for several days. Applying heat and keeping the affected area elevated may help relieve inflammation.

Risks

If there is any scarring, it is likely to become much less noticeable as time goes on, and eventually almost invisible. Occasionally, an abscess within a vital organ (such as the brain) damages enough surrounding tissue that there is some permanent loss of normal function.

Normal results

Most abscesses heal after drainage alone; others require drainage and antibiotic drug treatment.

Resources

BOOKS

Turkington, Carol A., and Jeffrey S. Dover. *Skin Deep*. New York: Facts on File, 1998.

ORGANIZATIONS

National Institute of Arthritis and Musculoskeletal and Skin Diseases. 9000 Rockville Pike, Bldg. 31, Rm 9A04, Bethesda, MD 20892.

Carol A. Turkington

Abuse

Definition

Abuse is defined as any thing that is harmful, injurious, or offensive. Abuse also includes excessive and wrongful misuse of anything. There are several major types of abuse: physical and sexual abuse of a child or an adult, substance abuse, elderly abuse, and emotional abuse.

Description

Physical abuse of a child is the infliction of injury by an other person. The injuries can include punching, kicking, biting, burning, beating, or pulling the victim's hair. The physical abuse inflicted on a child can result in **bruises, burns, poisoning**, broken bones, and internal hemorrhages. Physical assault against an adult primarily occurs with women, usually in the form of domestic violence. It is estimated that approximately three million children witness domestic violence every year.

Sexual abuse of a child refers to sexual behavior between an adult and child or between two children, one of whom is dominant or significantly older. The sexual behaviors can include touching breasts, genitals, and buttocks; either dressed or undressed. The behavior can also include exhibitionism, cunnilingus, fellatio, or penetration of the vagina or anus with sexual organs or objects.

Pornographic photography is also used in sexual abuse with children. Reported sex offenders are 97% male. Females are more often perpetrators in child-care settings, since children may confuse sexual abuse by a female with normal hygiene care. Sexual abuse by stepfathers is five times more common than with biological fathers. Sexual abuse of daughters by stepfathers or fathers is the most common form of incest.

Sexual abuse can also take the form of rape. The legal definition of rape includes only slight penile penetration in the victim's outer vulva area. Complete erection and ejaculation are not necessary. Rape is the perpetration of an act of sexual intercourse whether:

- will is overcome by force or fear (from threats or by use of drugs).

- mental impairment renders the victim incapable of rational judgment.
- if the victim is below the legal age established for consent.

Substance abuse is an abnormal pattern of substance usage leading to significant distress or impairment. The criteria include one or more of the following occurring within a 12-month period:

- recurrent substance use resulting in failure to fulfill obligations at home, work, or school.
- using substance in situations that are physically dangerous (i.e., while driving).
- recurrent substance-related legal problems.
- continued usage despite recurrent social and interpersonal problems (i.e., arguments and fights with significant other).

Abuse in the elderly is common and occurs mostly as a result of caretaker burnout, due to the high level of dependency frail, elderly patients usually require. Abuse can be manifested by physical signs, fear, and delaying or not reporting the need for advanced medical care. Elderly patients may also exhibit financial abuse (money or possessions taken away) and abandonment.

Emotional abuse generally continues even after physical assaults have stopped. In most cases it is a personally tailored form of verbal or gesture abuse expressed to illicit a provoked response.

Causes and symptoms

Children who have been abused usually have a variety of symptoms that encompass behavioral, emotional, and psychosomatic problems. Children who have been physically abused tend to be more aggressive, angry, hostile, depressed, and have low self-esteem. Additionally, they exhibit fear, **anxiety**, and nightmares. Severe psychological problems may result in suicidal behavior or posttraumatic **stress** disorder. Physically abused children may complain of physical illness even in the absence of a cause. They may also suffer from eating disorders and encopresis. Children who are sexually abused may exhibit abnormal sexual behavior in the form of aggressiveness and hyperarousal. Adolescents may display promiscuity, sexual acting out, and—in some situations—homosexual contact.

Physical abuse directed towards adults can ultimately lead to **death**. Approximately 50% of women murdered in the United States were killed by a former or current male partner. Approximately one-third of emergency room consultations by women were prompted due to domestic violence. Female victims who are married also have a higher rate of internal injuries and unconscious-

KEY TERMS

Encopresis—Abnormalities relating to bowel movements that can occur as a result of stress or fear.

ness than victims of stranger assault (mugging, robbery). Physical abuse or rape can also occur between married persons and persons of the same gender. Perpetrators usually sexually assault their victims to dominate, hurt, and debase them. It is common for physical and sexual violence to occur at the same time. A large percentage of sexually assaulted persons were also physically abused in the form of punching, beating, or threatening the victim with a weapon such as a gun or knife. Usually males who are hurt and humiliated tend to physical assault persons whom they are intimately involved with, such as spouses and/or children. Males who assault a female tend to have experienced or witnessed violence during childhood. They also tend to abuse alcohol, to be sexually assaultive, and are at increased risk for assaultive behavior directed against children. Jealous males tend to monitor the women's movements and whereabouts and to isolate other sources of protection and support. They interpret their behavior as betrayal of trust and this causes resentment and explosive anger outbursts during periods of losing control. Males may also use aggression against females in an effort to control and intimidate partners.

Abuse in the elderly usually occurs in the frail, elderly community. The caretaker is usually the perpetrator. Caretaker abuse can be suspected if there is evidence suggesting behavioral changes in the elderly person when the caretaker is present. Additionally, elderly abuse can be possible if there are delays between injuries and treatment, inconsistencies between injury and explanations, lack of hygiene or clothing, and prescriptions not being filled.

Diagnosis

Children who are victims of domestic violence are frequently injured attempting to protect their mother from an abusive partner. Injuries are visible by inspection or self-report. Physical abuse of an adult may be also be evident by inspection with visible cuts and/or bruises or self report.

Sexual abuse of both a child and an adult can be diagnosed with a history from the victim. Victims can be assessed for ejaculatory evidence from the perpetrator. Ejaculatory specimens can be retrieved from the mouth, rectum, and clothing. Tests for **sexually transmitted diseases** may be performed.

Elderly abuse can be suspected if the elderly patient demonstrates a fear from the caretaker. Additionally, elderly abuse can be suspected if there are signs indicating intentional delay of required medical care or a change in medical status.

Substance abuse can be suspected in a person who continues to indulge in their drug of choice despite recurrent negative consequences. The diagnosis can be made after administration of a comprehensive bio-psychosocial exam and standardized chemical abuse assessments by a therapist.

Treatment

Children who are victims of physical or sexual abuse typically require psychological support and medical attention. A complaint may be filed with the local family social services that will initiate investigations. The authorities will usually follow up the allegation or offense. Children may also be referred for psychological evaluation and/or treatment. The victim may be placed in foster care pending the investigation outcome. The police may also investigate physical and sexual abuse of an adult. The victim may require immediate medical care and long-term psychological treatment. It is common for children to be adversely affected by domestic violence situations and the local family services agency may be involved.

Substance abusers should elect treatment, either inpatient or outpatient, depending on severity of **addiction**. Long term treatment and/or medications may be utilized to assist in abstinence. The patient should be encouraged to participate in community centered support groups.

Prognosis

The prognosis depends on the diagnosis. Usually victims of physical and sexual abuse require therapy to deal with emotional distress associated with the incident. Perpetrators require further psychological evaluation and treatment. Victims of abuse may have a variety of emotional problems including depression, acts of suicide, or anxiety. Children of sexual abuse may as adults enter abusive relationships or have problems with intimacy. The substance abuser may experience relapses, since the cardinal feature of all addictive disorders is a tendency to return to symptoms. Elderly patients may suffer from further medical problems and/or anxiety, and in some cases neglect may precipitate death.

Prevention

Prevention programs are geared to education and awareness. Detection of initial symptoms or characteris-

tic behaviors may assist in some situations. In some cases treatment may be sought before incident. The professional treating the abused persons must develop a clear sense of the relationship dynamics and the chances for continued harm.

Resources

BOOKS

- Behrman, Richard E., et al, eds. *Nelson Textbook of Pediatrics*. 16th ed. W. B. Saunders Company, 2000.
- Duthie, Edmund H., et al, eds. *Practice of Geriatrics*. 3rd ed. W. B. Saunders Company, 1998.
- Rosen, Peter. *Emergency Medicine: Concepts and Clinical Practice*. 4th ed. Mosby-Year Book, Inc., 1998.

PERIODICALS

- Narendra, K., and S. Lazoritz. "Physical Assessment: Evaluation for Possible Physical and Sexual Abuse." *Pediatric Clinics of North America* 45 (Feb. 1998).
- Stringham, P. "Mental Health: Domestic Violence." *Primary Care; Clinics in Office Practice* 26 (June 1999).

ORGANIZATIONS

- National Clearinghouse on Child Abuse and Neglect Information. 330 C Street SW, Washington, DC 20447. (800) 392-3366.

OTHER

- Elder Abuse Prevention. <<http://www.oaktrees.org/elder>>.
- National Institute on Drug Abuse. <<http://www.nida.nih.gov>>.

Laith Farid Gulli, M.D.
Bilal Nasser, M.Sc.

Acceleration-deceleration cervical injury
see **Whiplash**

ACE inhibitors see **Angiotensin-converting enzyme inhibitors**

Acetaminophen

Definition

Acetaminophen is a medicine used to relieve **pain** and reduce **fever**.

Purpose

Acetaminophen is used to relieve many kinds of minor aches and pains—headaches, muscle aches, backaches, toothaches, menstrual cramps, arthritis, and the aches and pains that often accompany colds.

Description

This drug is available without a prescription. Acetaminophen—or APAP—is sold under various brand names, including Tylenol, Panadol, **Aspirin** Free Anacin, and Bayer Select Maximum Strength **Headache** Pain Relief Formula. Many multi-symptom cold, flu, and sinus medicines also contain acetaminophen. Check the ingredients listed on the container to see if acetaminophen is included in the product.

Studies have shown that acetaminophen relieves pain and reduces fever about as well as aspirin. But differences between these two common drugs exist. Acetaminophen is less likely than aspirin to irritate the stomach. However, unlike aspirin, acetaminophen does not reduce the redness, stiffness, or swelling that accompany arthritis.

Recommended dosage

The usual dosage for adults and children age 12 and over is 325-650 mg every 4-6 hours as needed. No more than 4 grams (4000 mg) should be taken in 24 hours. Because the drug can potentially harm the liver, people who drink alcohol in large quantities should take considerably less acetaminophen and possibly should avoid the drug completely.

For children ages 6-11 years, the usual dose is 150-300 mg, three to four times a day. Check with a physician for dosages for children under age 6 years.

Precautions

Never take more than the recommended dosage of acetaminophen unless told to do so by a physician or dentist.

Patients should not use acetaminophen for more than 10 days to relieve pain (5 days for children) or for more than 3 days to reduce fever, unless directed to do so by a physician. If symptoms do not go away—or if they get worse—contact a physician. Anyone who drinks three or more alcoholic beverages a day should check with a physician before using this drug and should never take more than the recommended dosage. A risk of liver damage exists from combining large amounts of alcohol and acetaminophen. People who already have kidney or liver disease or liver infections should also consult with a physician before using the drug. So should women who are pregnant or breastfeeding.

Smoking cigarettes may interfere with the effectiveness of acetaminophen. Smokers may need to take higher doses of the medicine, but should not take more than the recommended daily dosage unless told by a physician to do so.

KEY TERMS

Arthritis—Inflammation of the joints. The condition causes pain and swelling.

Fatigue—Physical or mental weariness.

Inflammation—A response to irritation, infection, or injury, resulting in pain, redness, and swelling.

Many drugs can interact with one another. Consult a physician or pharmacist before combining acetaminophen with any other medicine. Do not use two different acetaminophen-containing products at the same time.

Acetaminophen interferes with the results of some medical tests. Before having medical tests done, check to see whether taking acetaminophen will affect the results. Avoiding the drug for a few days before the tests may be necessary.

Side effects

Acetaminophen causes few side effects. The most common one is lightheadedness. Some people may experience trembling and pain in the side or the lower back. Allergic reactions do occur in some people, but they are rare. Anyone who develops symptoms such as a rash, swelling, or difficulty breathing after taking acetaminophen should stop taking the drug and get immediate medical attention. Other rare side effects include yellow skin or eyes, unusual bleeding or bruising, weakness, **fatigue**, bloody or black stools, bloody or cloudy urine, and a sudden decrease in the amount of urine.

Overdoses of acetaminophen may cause nausea, vomiting, sweating, and exhaustion. Very large overdoses can cause liver damage. In case of an overdose, get immediate medical attention.

Interactions

Acetaminophen may interact with a variety 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. Among the drugs that may interact with acetaminophen are alcohol, **nonsteroidal anti-inflammatory drugs** (NSAIDs) such as Motrin, **oral contraceptives**, the antiseizure drug phenytoin (Dilantin), the blood-thinning drug warfarin (Coumadin), the cholesterol-lowering drug cholestyramine (Questran), the antibiotic Isoniazid, and zidovudine (Retrovir, AZT).

Check with a physician or pharmacist before combining acetaminophen with any other prescription or nonprescription (over-the-counter) medicine.

Nancy Ross-Flanigan

Acetylsalicylic acid see **Aspirin**

Achalasia

Definition

Achalasia is a disorder of the esophagus that prevents normal swallowing.

Description

Achalasia affects the esophagus, the tube that carries swallowed food from the back of the throat down into the stomach. A ring of muscle called the lower esophageal sphincter encircles the esophagus just above the entrance to the stomach. This sphincter muscle is normally contracted to close the esophagus. When the sphincter is closed, the contents of the stomach cannot flow back into the esophagus. Backward flow of stomach contents (reflux) can irritate and inflame the esophagus, causing symptoms such as **heartburn**. The act of swallowing causes a wave of esophageal contraction called peristalsis. Peristalsis pushes food along the esophagus. Normally, peristalsis causes the esophageal sphincter to relax and allow food into the stomach. In achalasia, which means “failure to relax,” the esophageal sphincter remains contracted. Normal peristalsis is interrupted and food cannot enter the stomach.

Causes and symptoms

Causes

Achalasia is caused by degeneration of the nerve cells that normally signal the brain to relax the esophageal sphincter. The ultimate cause of this degeneration is unknown. Autoimmune disease or hidden infection is suspected.

Symptoms

Dysphagia, or difficulty swallowing, is the most common symptom of achalasia. The person with achalasia usually has trouble swallowing both liquid and solid foods, often feeling that food “gets stuck” on the way down. The person has chest **pain** that is often mistaken for **angina pectoris** (cardiac pain). Heartburn and difficulty belching

are common. Symptoms usually get steadily worse. Other symptoms may include nighttime **cough** or recurrent **pneumonia** caused by food passing into the lower airways.

Diagnosis

Diagnosis of achalasia begins with a careful medical history. The history should focus on the timing of symptoms and on eliminating other medical conditions that may cause similar symptoms. Tests used to diagnose achalasia include:

- Esophageal manometry. In this test, a thin tube is passed into the esophagus to measure the pressure exerted by the esophageal sphincter.
- X ray of the esophagus. Barium may be swallowed to act as a contrast agent. Barium reveals the outlines of the esophagus in greater detail and makes it easier to see its constriction at the sphincter.
- Endoscopy. In this test, a tube containing a lens and a light source is passed into the esophagus. Endoscopy is used to look directly at the surface of the esophagus. This test can also detect tumors that cause symptoms like those of achalasia. **Cancer** of the esophagus occurs as a complication of achalasia in 2-7% of patients.

Treatment

The first-line treatment for achalasia is balloon dilation. In this procedure, an inflatable membrane or balloon is passed down the esophagus to the sphincter and inflated to force the sphincter open. Dilation is effective in about 70% of patients.

Three other treatments are used for achalasia when balloon dilation is inappropriate or unacceptable.

- Botulinum toxin injection. Injected into the sphincter, botulinum toxin paralyzes the muscle and allows it to relax. Symptoms usually return within one to two years.
- Esophagomyotomy. This surgical procedure cuts the sphincter muscle to allow the esophagus to open. Esophagomyotomy is becoming more popular with the development of techniques allowing very small abdominal incisions.
- Drug therapy. Nifedipine, a calcium-channel blocker, reduces muscle contraction. Taken daily, this drug provides relief for about two-thirds of patients for as long as two years.

Prognosis

Most patients with achalasia can be treated effectively. Achalasia does not reduce life expectancy unless esophageal carcinoma develops.

KEY TERMS

Botulinum toxin—Any of a group of potent bacterial toxins or poisons produced by different strains of the bacterium *Clostridium botulinum*. The toxins cause muscle paralysis.

Dysphagia—Difficulty in swallowing.

Endoscopy—A test in which a viewing device and a light source are introduced into the esophagus by means of a flexible tube. Endoscopy permits visual inspection of the esophagus for abnormalities.

Esophageal manometry—A test in which a thin tube is passed into the esophagus to measure the degree of pressure exerted by the muscles of the esophageal wall.

Esophageal sphincter—A circular band of muscle that closes the last few centimeters of the esophagus and prevents the backward flow of stomach contents.

Esophagomyotomy—A surgical incision through the muscular tissue of the esophagus.

Esophagus—The muscular tube that leads from the back of the throat to the entrance of the stomach.

Peristalsis—The coordinated, rhythmic wave of smooth muscle contraction that forces food through the digestive tract.

Reflux—An abnormal backward or return flow of a fluid.

Prevention

There is no known way to prevent achalasia.

Resources

BOOKS

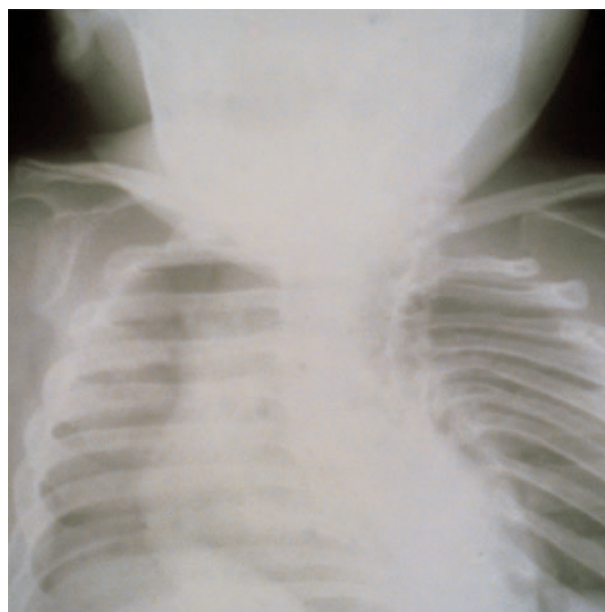
Grendell, James H., Kenneth R. McQuaid, and Scott L. Friedman, eds. *Current Diagnosis and Treatment in Gastroenterology*. Stamford: Appleton & Lange, 1996.

Richard Robinson

Achondroplasia

Definition

Achondroplasia is the most common cause of dwarfism, or significantly abnormal short stature.



An x-ray image of an achondroplastic person's head and chest. (Custom Medical Stock Photo. Reproduced by permission.)

Description

Achondroplasia is one of a number of chondrodystrophies, in which the development of cartilage, and therefore, bone is disturbed. The disorder appears in approximately one in every 10,000 births. Achondroplasia is usually diagnosed at birth, owing to the characteristic appearance of the newborn.

Normal bone growth depends on the production of cartilage (a fibrous connective tissue). Over time, calcium is deposited within the cartilage, causing it to harden and become bone. In achondroplasia, abnormalities of this process prevent the bones (especially those in the limbs) from growing as long as they normally should, at the same time allowing the bones to become abnormally thickened. The bones in the trunk of the body and the skull are mostly not affected, although the opening from the skull through which the spinal cord passes (foramen magnum) is often narrower than normal, and the opening (spinal canal) through which the spinal cord runs in the back bones (vertebrae) becomes increasingly and abnormally small down the length of the spine.

Causes and symptoms

Achondroplasia is caused by a genetic defect. It is a dominant trait, meaning that anybody with the genetic defect will display all the symptoms of the disorder. A parent with the disorder has a 50% chance of passing it

KEY TERMS

Cartilage—A flexible, fibrous type of connective tissue which serves as a base on which bone is built.

Foramen magnum—The opening at the base of the skull, through which the spinal cord and the brain-stem pass.

Hydrocephalus—An abnormal accumulation of fluid within the brain. This accumulation can be destructive by pressing on brain structures, and damaging them.

Mutation—A new, permanent change in the structure of a gene, which can result in abnormal structure or function somewhere in the body.

Spinal canal—The opening that runs through the center of the column of spinal bones (vertebrae), and through which the spinal cord passes.

Vertebrae—The individual bones of the spinal column which are stacked on top of each other. There is a hole in the center of each bone, through which the spinal cord passes.

on to the offspring. Although achondroplasia can be passed on to subsequent offspring, the majority of cases occur due to a new mutation (change) in a gene. Interestingly enough, the defect seen in achondroplasia is one of only a few defects known to increase in frequency with increasing age of the father (many genetic defects are linked to increased age of the mother).

People with achondroplasia have abnormally short arms and legs. Their trunk is usually of normal size, as is their head. The appearance of short limbs and normal head size actually makes the head appear to be oversized. The bridge of the nose often has a scooped out appearance termed "saddle nose." The lower back has an abnormal curvature, or sway back. The face often displays an overly prominent forehead, and a relative lack of development of the face in the area of the upper jaw. Because the foramen magnum and spinal canal are abnormally narrowed, nerve damage may occur if the spinal cord or nerves become compressed. The narrowed foramen magnum may disrupt the normal flow of fluid between the brain and the spinal cord, resulting in the accumulation of too much fluid in the brain (**hydrocephalus**). Children with achondroplasia have a very high risk of serious and repeated middle ear infections, which can result in **hearing loss**. The disease does not affect either mental capacity, or reproductive ability.

Diagnosis

Diagnosis is often made at birth due to the characteristically short limbs, and the appearance of a large head. X-ray examination will reveal a characteristic appearance to the bones, with the bones of the limbs appearing short in length, yet broad in width. A number of measurements of the bones in x-ray images will reveal abnormal proportions.

Treatment

No treatment will reverse the defect present in achondroplasia. All patients with the disease will be short, with abnormally proportioned limbs, trunk, and head. Treatment of achondroplasia primarily addresses some of the complications of the disorder, including problems due to nerve compression, hydrocephalus, bowed legs, and abnormal curves in the spine. Children with achondroplasia who develop middle ear infections (acute **otitis media**) will require quick treatment with **antibiotics** and careful monitoring in order to avoid hearing loss.

Prognosis

Achondroplasia is a disease which causes considerable deformity. However, with careful attention paid to the development of dangerous complications (nerve compression, hydrocephalus), most people are in good health, and can live a normal lifespan.

Prevention

The only form of prevention is through **genetic counseling**, which could help parents assess their risk of having a child with achondroplasia.

Resources

BOOKS

- Hall, Bryan D. "Achondroplasia." In *Nelson Textbook of Pediatrics*, ed. Richard E. Behrman. Philadelphia: W. B. Saunders Co., 1996.
- Horton, W. A., and J. T. Hecht. "The Chondrodysplasias." In *Connective Tissue and Its Heritable Disorders*, ed. R. M. Royce and B. Steinmann. Somerset, NJ: Wiley-Liss, 1993.
- Krane, Stephen M., and Alan L. Schiller. "Achondroplasia." In *Harrison's Principles of Internal Medicine*, ed. Anthony S. Fauci, et al. New York: McGraw-Hill, 1997.
- Whyte, Michael, P. "Achondroplasia." In *Cecil Textbook of Medicine*, ed. J. Claude Bennett and Fred Plum. Philadelphia: W. B. Saunders Co., 1996.

ORGANIZATIONS

- Little People of America, c/o Mary Carten. 7238 Piedmont Drive, Dallas, TX 75227-9324. (800) 243-9273.

Rosalyn Carson-DeWitt, MD

Achromatopsia see **Color blindness**

Acid indigestion see **Heartburn**

Acid phosphatase test

Definition

Acid phosphatase is an enzyme found throughout the body, but primarily in the prostate gland. Like all enzymes, it is needed to trigger specific chemical reactions. Acid phosphatase testing is done to diagnose whether **prostate cancer** has spread to other parts of the body (metastasized), and to check the effectiveness of treatment. The test has been largely supplanted by the prostate specific antigen test (PSA).

Purpose

The male prostate gland has 100 times more acid phosphatase than any other body tissue. When prostate **cancer** spreads to other parts of the body, acid phosphatase levels rise, particularly if the cancer spreads to the bone. One-half to three-fourths of persons who have metastasized prostate cancer have high acid phosphatase levels. Levels fall after the tumor is removed or reduced through treatment.

Tissues other than prostate have small amounts of acid phosphatase, including bone, liver, spleen, kidney, and red blood cells and platelets. Damage to these tissues causes a moderate increase in acid phosphatase levels.

Acid phosphatase is very concentrated in semen. Rape investigations will often include testing for the presence of acid phosphatase in vaginal fluid.

Precautions

This is not a screening test for prostate cancer. Acid phosphatase levels rise only after prostate cancer has metastasized.

Description

Laboratory testing measures the amount of acid phosphatase in a person's blood, and can determine from what tissue the enzyme is coming. For example, it is important to know if the increased acid phosphatase is from the prostate or red blood cells. Acid phosphatase from the prostate, called prostatic acid phosphatase (PAP), is the most medically significant type of acid phosphatase.

KEY TERMS

Enzyme—A substance needed to trigger specific chemical reactions.

Metastasize—Spread to other parts of the body; usually refers to cancer.

Prostate gland—A gland of the male reproductive system.

Subtle differences between prostatic acid phosphatase and acid phosphatases from other tissues cause them to react differently in the laboratory when mixed with certain chemicals. For example, adding the chemical tartrate to the test mixture inhibits the activity of prostatic acid phosphatase but not red blood cell acid phosphatase. Laboratory test methods based on these differences reveal how much of a person's total acid phosphatase is derived from the prostate. Results are usually available the next day.

Preparation

This test requires drawing about 5-10 mL of blood. The patient should not have a rectal exam or prostate massage for two to three days prior to the test.

Aftercare

Discomfort or bruising may occur at the puncture site, and the person may feel dizzy or faint. Applying pressure to the puncture site until the bleeding stops will reduce bruising. Warm packs to the puncture site will relieve discomfort.

Normal results

Normal results vary based on the laboratory and the method used.

Abnormal results

The highest levels of acid phosphatase are found in metastasized prostate cancer. Diseases of the bone, such as Paget's disease or **hyperparathyroidism**; diseases of blood cells, such as **sickle cell disease** or **multiple myeloma**; or lysosomal disorders, such as Gaucher's disease, will show moderately increased levels.

Certain medications can cause temporary increases or decreases in acid phosphatase levels. Manipulation of the prostate gland through massage, biopsy, or rectal exam before a test can increase the level.

Resources

BOOKS

- A Manual of Laboratory and Diagnostic Tests*. 5th ed. Ed. Francis Fishback. Philadelphia: Lippincott, 1996.
- Garza, Diana, and Kathleen Becan-McBride. *Phlebotomy Handbook*. 4th ed. Stamford: Appleton & Lange, 1996.

PERIODICALS

- Moul, Judd W., et al. "The Contemporary Value of Pretreatment Prostatic Acid Phosphatase to Predict Pathological Stage and Recurrence in Radical Prostatectomy Cases." *Journal of Urology* (Mar. 1998): 935-940.

Nancy J. Nordenson

Acid reflux see **Heartburn**

Acidosis see **Respiratory acidosis; Renal tubular acidosis; Metabolic acidosis**

Acne

Definition

Acne is a common skin disease characterized by pimples on the face, chest, and back. It occurs when the pores of the skin become clogged with oil, dead skin cells, and bacteria.

Description

Acne vulgaris, the medical term for common acne, is the most common skin disease. It affects nearly 17 million people in the United States. While acne can arise at any age, it usually begins at **puberty** and worsens during adolescence. Nearly 85% of people develop acne at some time between the ages of 12-25 years. Up to 20% of women develop mild acne. It is also found in some newborns.

The sebaceous glands lie just beneath the skin's surface. They produce an oil called sebum, the skin's natural moisturizer. These glands and the hair follicles within which they are found are called sebaceous follicles. These follicles open onto the skin through pores. At puberty, increased levels of androgens (male hormones) cause the glands to produce too much sebum. When excess sebum combines with dead, sticky skin cells, a hard plug, or comedo, forms that blocks the pore. Mild noninflammatory acne consists of the two types of comedones, whiteheads and blackheads.

Moderate and severe inflammatory types of acne result after the plugged follicle is invaded by *Propionibacterium acnes*, a bacteria that normally lives on the

skin. A pimple forms when the damaged follicle weakens and bursts open, releasing sebum, bacteria, and skin and white blood cells into the surrounding tissues. Inflamed pimples near the skin's surface are called papules; when deeper, they are called pustules. The most severe type of acne consists of cysts (closed sacs) and nodules (hard swellings). Scarring occurs when new skin cells are laid down to replace damaged cells.

The most common sites of acne are the face, chest, shoulders, and back since these are the parts of the body where the most sebaceous follicles are found.

Causes and symptoms

The exact cause of acne is unknown. Several risk factors have been identified:

- **Age.** Due to the hormonal changes they experience, teenagers are more likely to develop acne.
- **Gender.** Boys have more severe acne and develop it more often than girls.
- **Disease.** Hormonal disorders can complicate acne in girls.
- **Heredity.** Individuals with a family history of acne have greater susceptibility to the disease.
- **Hormonal changes.** Acne can flare up before menstruation, during **pregnancy**, and **menopause**.
- **Diet.** No foods cause acne, but certain foods may cause flare-ups.
- **Drugs.** Acne can be a side effect of drugs including tranquilizers, antidepressants, **antibiotics**, **oral contraceptives**, and anabolic steroids.
- **Personal hygiene.** Abrasive soaps, hard scrubbing, or picking at pimples will make them worse.
- **Cosmetics.** Oil-based makeup and hair sprays worsen acne.
- **Environment.** Exposure to oils and greases, polluted air, and sweating in hot weather aggravate acne.
- **Stress.** Emotional stress may contribute to acne.

Acne is usually not conspicuous, although inflamed lesions may cause **pain**, tenderness, **itching**, or swelling. The most troubling aspects of these lesions are the negative cosmetic effects and potential for scarring. Some people, especially teenagers, become emotionally upset about their condition, and have problems forming relationships or keeping jobs.

Diagnosis

Acne patients are often treated by family doctors. Complicated cases are referred to a dermatologist, a skin

disease specialist, or an endocrinologist, a specialist who treats diseases of the body's endocrine (hormones and glands) system.

Acne has a characteristic appearance and is not difficult to diagnose. The doctor takes a complete medical history, including questions about skin care, diet, factors causing flare-ups, medication use, and prior treatment. **Physical examination** includes the face, upper neck, chest, shoulders, back, and other affected areas. Under good lighting, the doctor determines what types and how many blemishes are present, whether they are inflamed, whether they are deep or superficial, and whether there is scarring or skin discoloration.

In teenagers, acne is often found on the forehead, nose, and chin. As people get older, acne tends to appear towards the outer part of the face. Adult women may have acne on their chins and around their mouths. The elderly may develop whiteheads and blackheads on the upper cheeks and skin around the eyes.

Laboratory tests are not done unless the patient appears to have a hormonal disorder or other medical problem. In this case, blood analyses or other tests may be ordered. Most insurance plans cover the costs of diagnosing and treating acne.

Treatment

Acne treatment consists of reducing sebum production, removing dead skin cells, and killing bacteria with topical drugs and oral medications. Treatment choice depends upon whether the acne is mild, moderate, or severe.

Drugs

TOPICAL DRUGS. Treatment for mild noninflammatory acne consists of reducing the formation of new comedones with topical tretinoin, benzoyl peroxide, adapalene, or salicylic acid. Tretinoin is especially effective because it increases turnover (**death** and replacement) of skin cells. When complicated by inflammation, topical antibiotics may be added to the treatment regimen. Improvement is usually seen in two to four weeks.

Topical medications are available as cream, gel, lotion, or pad preparations of varying strengths. They include antibiotics (agents that kill bacteria), such as erythromycin, clindamycin (Cleocin-T), and meclocycline (Meclan); comedolytics (agents that loosen hard plugs and open pores) such as the vitamin A acid tretinoin (Retin-A), salicylic acid, adapalene (Differin), resorcinol, and sulfur. Drugs that act as both comedolytics and antibiotics, such as benzoyl peroxide, azelaic acid (Azelex), or benzoyl peroxide plus erythromycin (Benza-



Acne vulgaris affecting a woman's face. Acne is the general name given to a skin disorder in which the sebaceous glands become inflamed. (Photograph by Biophoto Associates, Photo Researchers, Inc. Reproduced by permission.)

mycin), are also used. These drugs may be used for months to years to achieve disease control.

After washing with mild soap, the drugs are applied alone or in combination, once or twice a day over the entire affected area of skin. Possible side effects include mild redness, peeling, irritation, dryness, and an increased sensitivity to sunlight that requires use of a sunscreen.

ORAL DRUGS. Oral antibiotics are taken daily for two to four months. The drugs used include tetracycline, erythromycin, minocycline (Minocin), doxycycline, clindamycin (Cleocin), and trimethoprim-sulfamethoxazole (Bactrim, Septra). Possible side effects include allergic reactions, stomach upset, vaginal yeast infections, **dizziness**, and tooth discoloration.

The goal of treating moderate acne is to decrease inflammation and prevent new comedone formation. One effective treatment is topical tretinoin along with a topical

KEY TERMS

Androgens—Male sex hormones that are linked with the development of acne.

Antiandrogens—Drugs that inhibit the production of androgens.

Antibiotics—Medicines that kill bacteria.

Comedo—A hard plug composed of sebum and dead skin cells. The mildest type of acne.

Comedolytic—Drugs that break up comedones and open clogged pores.

Corticosteroids—A group of hormones produced by the adrenal glands with different functions, including regulation of fluid balance, androgen activity, and reaction to inflammation.

Estrogens—Hormones produced by the ovaries, the female sex glands.

Isotretinoin—A drug that decreases sebum production and dries up acne pimples.

Sebaceous follicles—A structure found within the skin that houses the oil-producing glands and hair follicles, where pimples form.

Sebum—An oily skin moisturizer produced by sebaceous glands.

Tretinoin—A drug that works by increasing the turnover (death and replacement) of skin cells.

or oral antibiotic. A combination of topical benzoyl peroxide and erythromycin is also very effective. Improvement is normally seen within four to six weeks, but treatment is maintained for at least two to four months.

A drug reserved for the treatment of severe acne, oral isotretinoin (Accutane), reduces sebum production and cell stickiness. It is the treatment of choice for severe acne with cysts and nodules, and is used with or without topical or oral antibiotics. Taken for four to five months, it provides long-term disease control in up to 60% of patients. If the acne reappears, another course of isotretinoin may be needed by about 20% of patients, while another 20% may do well with topical drugs or oral antibiotics. Side effects include temporary worsening of the acne, dry skin, nosebleeds, vision disorders, and elevated liver enzymes, blood fats and cholesterol. This drug must not be taken during pregnancy since it causes **birth defects**.

Anti-androgens, drugs that inhibit androgen production, are used to treat women who are unresponsive to other therapies. Certain types of oral contraceptives (for

example, Ortho-Tri-Cyclen) and female sex hormones (estrogens) reduce hormone activity in the ovaries. Other drugs, for example, spironolactone and **corticosteroids**, reduce hormone activity in the adrenal glands. Improvement may take up to four months.

Oral corticosteroids, or anti-inflammatory drugs, are the treatment of choice for an extremely severe, but rare type of destructive inflammatory acne called acne fulminans, found mostly in adolescent males. Acne conglobata, a more common form of severe inflammation, is characterized by numerous, deep, inflammatory nodules that heal with scarring. It is treated with oral isotretinoin and corticosteroids.

Other treatments

Several surgical or medical treatments are available to alleviate acne or the resulting scars:

- Comedone extraction. The comedo is removed from the pore with a special tool.
- Chemical peels. Glycolic acid is applied to peel off the top layer of skin to reduce scarring.
- Dermabrasion. The affected skin is frozen with a chemical spray, and removed by brushing or planing.
- Punch grafting. Deep scars are excised and the area repaired with small skin grafts.
- Intralesional injection. Corticosteroids are injected directly into inflamed pimples.
- Collagen injection. Shallow scars are elevated by collagen (protein) injections.

Alternative treatment

Alternative treatments for acne focus on proper cleansing to keep the skin oil-free; eating a well-balanced diet high in fiber, zinc, and raw foods; and avoiding alcohol, dairy products, **smoking**, **caffeine**, sugar, processed foods, and foods high in iodine, such as salt. Supplementation with herbs such as burdock root (*Arctium lappa*), red clover (*Trifolium pratense*), and milk thistle (*Silybum marianum*), and with nutrients such as essential fatty acids, vitamin B complex, zinc, vitamin A, and chromium is also recommended. Chinese herbal remedies used for acne include cnidium seed (*Cnidium monnieri*) and honeysuckle flower (*Lonicera japonica*). Wholistic physicians or nutritionists can recommend the proper amounts of these herbs.

Prognosis

Acne is not curable, although long-term control is achieved in up to 60% of patients treated with

isotretinoin. It can be controlled by proper treatment, with improvement taking two or more months. Acne tends to reappear when treatment stops, but spontaneously improves over time. Inflammatory acne may leave scars that require further treatment.

Prevention

There are no sure ways to prevent acne, but the following steps may be taken to minimize flare-ups:

- gentle washing of affected areas once or twice every day
- avoid abrasive cleansers
- use noncomedogenic makeup and moisturizers
- shampoo often and wear hair off face
- eat a well-balanced diet, avoiding foods that trigger flare-ups
- unless told otherwise, give dry pimples a limited amount of sun exposure
- do not pick or squeeze blemishes
- reduce stress

Resources

BOOKS

- Balch, James F., and Phyllis A. Balch. "The Disorders: Acne." In *Prescription for Nutritional Healing*, ed. Amy C. Tecklenburg, et al. New York: Avery Publishing Group, 1997.
- Bark, Joseph P. *Your Skin: An Owner's Guide*. Englewood Cliffs, NJ: Prentice Hall, 1995.
- Goldstein, Sanford M., and Richard B. Odom. "Skin & Appendages: Pustular Disorders." In *Current Medical Diagnosis and Treatment*, 1996. 35th ed. Ed. Stephen McPhee, et al. Stamford: Appleton & Lange, 1995.
- Kapchuk, Ted J., Z'ev Rosenberg, and K'an Herb Co., Inc. *K'an Herbs: Formulas by Ted Kapchuk, O.M.D.* San Francisco: Andrew Miller, 1996.

PERIODICALS

- "Adult Acne." *Harvard Women's Health Watch* (Mar. 1995): 4-5.
- Bergfeld, Wilma F. "The Evaluation and Management of Acne: Economic Considerations." *Journal of the American Academy of Dermatology* 32 (1995): S52-6.
- Billings, Laura. "Getting Clear." *Health Magazine*, Apr. 1997, 48-52.
- Christiano, Donna. "Acne Treatment Meant for Grown-Ups." *American Health* (Oct. 1994): 23-4.
- "Clearly Better New Treatments Help Adult Acne." *Prevention Magazine*, Aug. 1997, 50-51.
- Leyden, James J. "Therapy For Acne Vulgaris." *New England Journal of Medicine* 17 (Apr. 1997): 1156-1162.
- Nguyen, Quan H., Y. Alyssa Kim, and Robert A. Schwartz. "Management of Acne Vulgaris." *American Family Physician* (July 1994): 89-96.
- "Pimple Control Pill?" *Prevention Magazine*, May 1997, 132.

ORGANIZATIONS

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Acne rosacea see **Rosacea**

Acoustic neurinoma see **Acoustic neuroma**

Acoustic neuroma

Definition

An acoustic neuroma is a benign tumor involving cells of the myelin sheath that surrounds the vestibulocochlear nerve (eighth cranial nerve).

Description

The vestibulocochlear nerve extends from the inner ear to the brain and is made up of a vestibular branch, often called the vestibular nerve, and a cochlear branch, called the cochlear nerve. The vestibular and cochlear nerves lie next to one another. They also run along side other cranial nerves. People possess two of each type of vestibulocochlear nerve, one that extends from the left ear and one that extends from the right ear.

The vestibular nerve transmits information concerning balance from the inner ear to the brain and the cochlear nerve transmits information about hearing. The vestibular nerve, like many nerves, is surrounded by a cover called a myelin sheath. A tumor, called a schwannoma, can sometimes develop from the cells of the myelin sheath. A tumor is an abnormal growth of tissue that results from the uncontrolled growth of cells. Acoustic neuromas are often called vestibular schwannomas because they are tumors that arise from the myelin sheath that surrounds the vestibular nerve. Acoustic neuromas are considered benign (non-cancerous) tumors since they do not spread to other parts of the body. They can occur anywhere along the vestibular nerve but are most likely to occur where the vestibulocochlear nerve passes through the tiny bony canal that connects the brain and the inner ear.

An acoustic neuroma can arise from the left vestibular nerve or the right vestibular nerve. A unilateral tumor is a tumor arising from one nerve and a bilateral tumor arises from both vestibular nerves. Unilateral acoustic neuromas usually occur spontaneously (by chance). Bilateral acoustic neuromas occur as part of a hereditary con-

dition called **Neurofibromatosis Type 2 (NF2)**. A person with NF2 has inherited a predisposition for developing acoustic neuromas and other tumors of the nerve cells.

Acoustic neuromas usually grow slowly and can take years to develop. Some acoustic neuromas remain so small that they do not cause any symptoms. As the acoustic neuroma grows it can interfere with the functioning of the vestibular nerve and can cause vertigo and balance difficulties. If the acoustic nerve grows large enough to press against the cochlear nerve, then **hearing loss** and a ringing (**tinnitus**) in the affected ear will usually occur. If untreated and the acoustic neuroma continues to grow it can press against other nerves in the region and cause other symptoms. This tumor can be life threatening if it becomes large enough to press against and interfere with the functioning of the brain.

Causes and symptoms

Causes

An acoustic neuroma is caused by a change or absence of both of the NF2 tumor suppressor genes in a nerve cell. Every person possesses a pair of NF2 genes in every cell of their body including their nerve cells. One NF2 gene is inherited from the egg cell of the mother and one NF2 gene is inherited from the sperm cell of the father. The NF2 gene is responsible for helping to prevent the formation of tumors in the nerve cells. In particular the NF2 gene helps to prevent acoustic neuromas.

Only one unchanged and functioning NF2 gene is necessary to prevent the formation of an acoustic neuroma. If both NF2 genes become changed or missing in one of the myelin sheath cells of the vestibular nerve then an acoustic neuroma will usually develop. Most unilateral acoustic neuromas result when the NF2 genes become spontaneously changed or missing. Someone with a unilateral acoustic neuroma that has developed spontaneously is not at increased risk for having children with an acoustic neuroma. Some unilateral acoustic neuromas result from the hereditary condition NF2. It is also possible that some unilateral acoustic neuromas may be caused by changes in other genes responsible for preventing the formation of tumors.

Bilateral acoustic neuromas result when someone is affected with the hereditary condition NF2. A person with NF2 is typically born with one unchanged and one changed or missing NF2 gene in every cell of their body. Sometimes they inherit this change from their mother or father. Sometimes the change occurs spontaneously when the egg and sperm come together to form the first cell of the baby. The children of a person with NF2 have a 50% chance of inheriting the changed or missing NF2 gene.

A person with NF2 will develop an acoustic neuroma if the remaining unchanged NF2 gene becomes spontaneously changed or missing in one of the myelin sheath cells of their vestibular nerve. People with NF2 often develop acoustic neuromas at a younger age. The mean age of onset of acoustic neuroma in NF2 is 31 years of age versus 50 years of age for sporadic acoustic neuromas. Not all people with NF2, however, develop acoustic neuromas. People with NF2 are at increased risk for developing **cataracts** and tumors in other nerve cells.

Most people with a unilateral acoustic neuroma are not affected with NF2. Some people with NF2, however, only develop a tumor in one of the vestibulocochlear nerves. Others may initially be diagnosed with a unilateral tumor but may develop a tumor in the other nerve a number of years later. NF2 should be considered in someone under the age of 40 who has a unilateral acoustic neuroma. Someone with a unilateral acoustic neuroma and other family members diagnosed with NF2 probably is affected with NF2. Someone with a unilateral acoustic neuroma and other symptoms of NF2 such as cataracts and other tumors may also be affected with NF2. On the other hand, someone over the age of 50 with a unilateral acoustic neuroma, no other tumors and no family history of NF2 is very unlikely to be affected with NF2.

Symptoms

Small acoustic neuromas usually only interfere with the functioning of the vestibulocochlear nerve. The most common first symptom of an acoustic neuroma is hearing loss, which is often accompanied by a ringing sound (tinnitus). People with acoustic neuromas sometimes report difficulties in using the phone and difficulties in perceiving the tone of a musical instrument or sound even when their hearing appears to be otherwise normal. In most cases the hearing loss is initially subtle and worsens gradually over time until deafness occurs in the affected ear. In approximately 10% of cases the hearing loss is sudden and severe.

Acoustic neuromas can also affect the functioning of the vestibular branch of the vestibulocochlear nerve and can cause vertigo and dysequilibrium. Twenty percent of small tumors are associated with periodic vertigo, which is characterized by **dizziness** or a whirling sensation. Larger acoustic neuromas are less likely to cause vertigo but more likely to cause dysequilibrium. Dysequilibrium, which is characterized by minor clumsiness and a general feeling of instability, occurs in nearly 50% of people with an acoustic neuroma.

As the tumor grows larger it can press on the surrounding cranial nerves. Compression of the fifth cranial nerve can result in facial **pain** and or numbness. Compression of the seventh cranial nerve can cause spasms, weakness or

KEY TERMS

Benign tumor—A localized overgrowth of cells that does not spread to other parts of the body.

Chromosome—A microscopic structure, made of a complex of proteins and DNA, that is found within each cell of the body.

Computed tomography (CT)—An examination that uses a computer to compile and analyze the images produced by x rays projected at a particular part of the body.

Cranial nerves—The set of twelve nerves found on each side of the head and neck that control the sensory and muscle functions of a number of organs such as the eyes, nose, tongue face and throat.

DNA testing—Testing for a change or changes in a gene or genes.

Gene—A building block of inheritance, made up of a compound called DNA (deoxyribonucleic acid) and containing the instructions for the production of a particular protein. Each gene is found on a specific location on a chromosome.

Magnetic resonance imaging (MRI)—A test which

uses an external magnetic field instead of x rays to visualize different tissues of the body.

Myelin sheath—The cover that surrounds many nerve cells and helps to increase the speed by which information travels along the nerve.

Neurofibromatosis type 2 (NF2)—A hereditary condition associated with an increased risk of bilateral acoustic neuromas, other nerve cell tumors and cataracts.

Protein—A substance produced by a gene that is involved in creating the traits of the human body such as hair and eye color or is involved in controlling the basic functions of the human body.

Schwannoma—A tumor derived from the cells of the myelin sheath that surrounds many nerve cells.

Tinnitus—A ringing sound or other noise in the ear.

Vertigo—A feeling of spinning or whirling.

Vestibulocochlear nerve (Eighth cranial nerve)—Nerve that transmits information, about hearing and balance from the ear to the brain.

paralysis of the facial muscles. Double vision is a rare symptom but can result when the 6th cranial nerve is affected. Swallowing and/or speaking difficulties can occur if the tumor presses against the 9th, 10th, or 12th cranial nerves.

If left untreated, the tumor can become large enough to press against and affect the functioning of the brain stem. The brain stem is the stalk like portion of the brain that joins the spinal cord to the cerebrum, the thinking and reasoning part of the brain. Different parts of the brainstem have different functions such as the control of breathing and muscle coordination. Large tumors that impact the brain stem can result in headaches, walking difficulties (gait ataxia) and involuntary shaking movements of the muscles (**tremors**). In rare cases when an acoustic neuroma remains undiagnosed and untreated it can cause nausea, vomiting, lethargy and eventually **coma**, respiratory difficulties and **death**. In the vast majority of cases, however, the tumor is discovered and treated long before it is large enough to cause such serious manifestations.

Diagnosis

Anyone with symptoms of hearing loss should undergo hearing evaluations. Pure tone and speech **audiometry**

are two screening tests that are often used to evaluate hearing. Pure tone audiometry tests to see how well someone can hear tones of different volume and pitch and speech audiometry tests to see how well someone can hear and recognize speech. An acoustic neuroma is suspected in someone with unilateral hearing loss or hearing loss that is less severe in one ear than the other ear (asymmetrical).

Sometimes an auditory brainstem response (ABR, BAER) test is performed to help establish whether someone is likely to have an acoustic neuroma. During the ABR examination, a harmless electrical impulse is passed from the inner ear to the brainstem. An acoustic neuroma can interfere with the passage of this electrical impulse and this interference can, sometimes be identified through the ABR evaluation. A normal ABR examination does not rule out the possibility of an acoustic neuroma. An abnormal ABR examination increases the likelihood that an acoustic neuroma is present but other tests are necessary to confirm the presence of a tumor.

If an acoustic neuroma is strongly suspected then **magnetic resonance imaging (MRI)** is usually performed. The MRI is a very accurate evaluation that is

able to detect nearly 100% of acoustic neuromas. Computerized tomography (CT scan, CAT scan) is unable to identify smaller tumors; but it can be used when an acoustic neuroma is suspected and an MRI evaluation cannot be performed.

Once an acoustic neuroma is diagnosed, an evaluation by genetic specialists such as a geneticist and genetic counselor may be recommended. The purpose of this evaluation is to obtain a detailed family history and check for signs of NF2. If NF2 is strongly suspected then DNA testing may be recommended. DNA testing involves checking the blood cells obtained from a routine blood draw for the common gene changes associated with NF2.

Treatment

The three treatment options for acoustic neuroma are surgery, radiation, and observation. The physician and patient should discuss the pros and cons of the different options prior to making a decision about treatment. The patient's, physical health, age, symptoms, tumor size, and tumor location should be considered.

Microsurgery

The surgical removal of the tumor or tumors is the most common treatment for acoustic neuroma. In most cases the entire tumor is removed during the surgery. If the tumor is large and causing significant symptoms, yet there is a need to preserve hearing in that ear, then only part of the tumor may be removed. During the procedure the tumor is removed under microscopic guidance and general anesthetic. Monitoring of the neighboring cranial nerves is done during the procedure so that damage to these nerves can be prevented. If preservation of hearing is a possibility, then monitoring of hearing will also take place during the surgery.

Most people stay in the hospital four to seven days following the surgery. Total recovery usually takes four to six weeks. Most people experience **fatigue** and head discomfort following the surgery. Problems with balance and head and neck stiffness are also common. The mortality rate of this type of surgery is less than 2% at most major centers. Approximately 20% of patients experience some degree of post-surgical complications. In most cases these complications can be managed successfully and do not result in long term medical problems. Surgery brings with it a risk of **stroke**, damage to the brain stem, infection, leakage of spinal fluid and damage to the cranial nerves. Hearing loss and/or tinnitus often result from the surgery. A follow-up MRI is recommended one to five years following the surgery because of possible regrowth of the tumor.

Stereotactic Radiation therapy

During stereotactic **radiation therapy**, also called radiosurgery or radiotherapy, many small beams of radiation are aimed directly at the acoustic neuroma. The radiation is administered in a single large dose, under local anesthetic and is performed on an outpatient basis. This results in a high dose of radiation to the tumor but little radiation exposure to the surrounding area. This treatment approach is limited to small or medium tumors. The goal of the surgery is to cause tumor shrinkage or at least limit the growth of the tumor. The long term efficacy and risks of this treatment approach are not known. Periodic MRI monitoring throughout the life of the patient is therefore recommended.

Radiation therapy can cause hearing loss which can sometimes occur even years later. Radiation therapy can also cause damage to neighboring cranial nerves, which can result in symptoms such as numbness, pain or paralysis of the facial muscles. In many cases these symptoms are temporary. Radiation treatment can also induce the formation of other benign or malignant schwannomas. This type of treatment may therefore be contraindicated in the treatment of acoustic neuromas in those with NF2 who are predisposed to developing schwannomas and other tumors.

Observation

Acoustic neuromas are usually slow growing and in some cases they will stop growing and even become smaller or disappear entirely. It may therefore be appropriate in some cases to hold off on treatment and to periodically monitor the tumor through MRI evaluations. Long-term observation may be appropriate for example in an elderly person with a small acoustic neuroma and few symptoms. Periodic observation may also be indicated for someone with a small and asymptomatic acoustic neuroma that was detected through an evaluation for another medical problem. Observation may also be suggested for someone with an acoustic neuroma in the only hearing ear or in the ear that has better hearing. The danger of an observational approach is that as the tumor grows larger it can become more difficult to treat.

Prognosis

The prognosis for someone with a unilateral acoustic neuroma is usually quite good provided the tumor is diagnosed early and appropriate treatment is instituted. Long term hearing loss and tinnitus in the affected ear are common, even if appropriate treatment is provided. Regrowth of the tumor is also a possibility following surgery or radiation therapy and repeat treatment may be necessary. The prognosis can be poorer for those with NF2 who have an increased risk of bilateral acoustic neuromas and other tumors.

Resources

BOOKS

- Filipo, R., and Barbara Maurizio. *Acoustic neuroma: trends and controversies: proceedings of the Symposium Acoustic Neuroma: Trends and Controversies, Rome, Italy, November 13–15, 1997*. The Hague, Netherlands: Kugler, 1999.
- Malis, Leonard. *Acoustic Neuroma*. New York: Elsevier, 1998.
- Roland, Peter, and Bradley Marple. *Diagnosis and Management of Acoustic Neuroma (Sipac)*. Alexandria, VA: American Academy of Otolaryngology—Head and Neck Survey Foundation, 1998.

PERIODICALS

- Broad, R. W. "Management of Acoustic Neuroma." In *New England Journal of Medicine*. 340(14) (8 April 1999):1119.
- Lederman G, E. Arbit, and J. Lowry. "Management of Acoustic Neuroma." *New England Journal of Medicine*. 340(14) (8 April 1999):1119–1120.
- Levo H, I. Pyykkö, and G. Blomstedt. "Non-surgical Treatment of Vestibular Schwannoma Patients." *Acta Otolaryngologica* 529 (1997): 56–8.
- O'Donoghue G.M., T. Nikolopoulos and J. Thomsen. "Management of Acoustic Neuroma." In *New England Journal of Medicine* 340(14) (8 April 1999):1120–1121.
- Rigby, P. L., et al. "Acoustic Neuroma Surgery: Outcome Analysis of Patient-Perceived Disability." In *American Journal of Otology* 18 (July 1997): 427–35.
- van Roijen, L., et al. "Costs and Effects of Microsurgery versus Radiosurgery in Treating Acoustic Neuroma." In *Acta Neurochirurgica* 139 (1997): 942–48.

ORGANIZATIONS

- Acoustic Neuroma Association. 600 Peachtree Pkwy, Suite 108, Cumming, GA 30041-6899. Phone:(770) 205-8211. Fax: (770) 205-0239. ANAusa@aol.com <<http://anausa.org>>. 28 June 2001.
- Acoustic Neuroma Association of Canada Box 369, Edmonton, AB T5J 2J6. 1-800-561-ANAC(2622). (780)428-3384. anac@compusmart.ab.ca. <<http://www.anac.ca>>. 28 June 2001.
- British Acoustic Neuroma Association. Oak House, Ransom Wood Business Park, Southwell Road West, Mansfield, Nottingham, NG21 0HJ. Tel: 01623 632143. Fax: 01623 635313. bana@btclick.com. <<http://www.ukan.co.uk/bana>>. 28 June 2001.
- Seattle Acoustic Neuroma Group. Emcityland@aol.com <<http://acousticneuromaseattle.org/entryenglish.html>>. 28 June 2001.

OTHER

- National Institute of Health Consensus Statement Online. *Acoustic Neuroma* 9(4)(11-13 December 1991). <<http://text.nlm.nih.gov/nih/cdc/www/87txt.html>>. (28 June 2001).
- University of California at San Francisco (UCSF). *Information on Acoustic Neuromas* (28 June 2001). <<http://itsa.ucsf.edu/~rkj/IndexAN.html>>.

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Acquired hypogammaglobulinemia see
Common variable immunodeficiency

Acquired immunodeficiency syndrome see
AIDS

Acrocyanosis

Definition

Acrocyanosis is a decrease in the amount of oxygen delivered to the extremities. The hands and feet turn blue because of the lack of oxygen. Decreased blood supply to the affected areas is caused by constriction or spasm of small blood vessels.

Description

Acrocyanosis is a painless disorder caused by constriction or narrowing of small blood vessels in the skin of affected patients. The spasm of the blood vessels decreases the amount of blood that passes through them, resulting in less blood being delivered to the hands and feet. The hands may be the main area affected. The affected areas turn blue and become cold and sweaty. Localized swelling may also occur. Emotion and cold temperatures can worsen the symptoms, while warmth can decrease symptoms. The disease is seen mainly in women and the effect of the disorder is mainly cosmetic. People with the disease tend to be uncomfortable, with sweaty, cold, bluish colored hands and feet.

Causes and symptoms

The sympathetic nerves cause constriction or spasms in the peripheral blood vessels that supply blood to the extremities. The spasms are a contraction of the muscles in the walls of the blood vessels. The contraction decreases the internal diameter of the blood vessels, thereby decreasing the amount of blood flow through the affected area. The spasms occur on a persistent basis, resulting in long term reduction of blood supply to the hands and feet. Sufficient blood still passes through the blood vessels so that the tissue in the affected areas does not starve for oxygen or die. Mainly, blood vessels near the surface of the skin are affected.

Diagnosis

Diagnosis is made by observation of the main clinical symptoms, including persistently blue and sweaty hands and/or feet and a lack of **pain**. Cooling the hands increases the blueness, while warming the hands decreases

KEY TERMS

Sympathetic nerve—A nerve of the autonomic nervous system that regulates involuntary and automatic reactions, especially to stress.

es the blue color. The acrocyanosis patient's pulse is normal, which rules out obstructive diseases. **Raynaud's disease** differs from acrocyanosis in that it causes white and red skin coloration phases, not just bluish discoloration.

Treatment

Acrocyanosis usually isn't treated. Drugs that block the uptake of calcium (**calcium channel blockers**) and alpha-one antagonists reduce the symptoms in most cases. Drugs that dilate blood vessels are only effective some of the time. Sweating from the affected areas can be profuse and require treatment. Surgery to cut the sympathetic nerves is performed rarely.

Prognosis

Acrocyanosis is a benign and persistent disease. The main concern of patients is cosmetic. Left untreated, the disease does not worsen.

Resources

BOOKS

- Alexander, R. W., R. C. Schlant, and V. Fuster, eds. *The Heart*. 9th ed. New York: McGraw-Hill, 1998.
- Berkow, Robert, ed. *Merck Manual of Medical Information*. Whitehouse Station, NJ: Merck Research Laboratories, 1997.
- Larsen, D. E., ed. *Mayo Clinic Family Health Book*. New York: William Morrow and Co., Inc., 1996.

John T. Lohr, PhD

Acromegaly and gigantism

Definition

Acromegaly is a disorder in which the abnormal release of a particular chemical from the pituitary gland in the brain causes increased growth in bone and soft tissue, as well as a variety of other disturbances throughout the body. This chemical released from the pituitary gland is called growth hormone (GH). The body's ability to

process and use nutrients like fats and sugars is also altered. In children whose bony growth plates have not closed, the chemical changes of acromegaly result in exceptional growth of long bones. This variant is called gigantism, with the additional bone growth causing unusual height. When the abnormality occurs after bone growth stops, the disorder is called acromegaly.

Description

Acromegaly is a relatively rare disorder, occurring in approximately 50 out of every one million people (50/1,000,000). Both men and women are affected. Because the symptoms of acromegaly occur so gradually, diagnosis is often delayed. The majority of patients are not identified until they are middle aged.

Causes and symptoms

The pituitary is a small gland located at the base of the brain. A gland is a collection of cells that releases certain chemicals, or hormones, which are important to the functioning of other organs or body systems. The pituitary hormones travel throughout the body and are involved in a large number of activities, including the regulation of growth and reproductive functions. The cause of acromegaly can be traced to the pituitary's production of GH.

Under normal conditions, the pituitary receives input from another brain structure, the hypothalamus, located at the base of the brain. This input from the hypothalamus regulates the pituitary's release of hormones. For example, the hypothalamus produces growth hormone-releasing hormone (GHRH), which directs the pituitary to release GH. Input from the hypothalamus should also direct the pituitary to stop releasing hormones.

In acromegaly, the pituitary continues to release GH and ignores signals from the hypothalamus. In the liver, GH causes production of a hormone called insulin-like growth factor 1 (IGF-1), which is responsible for growth throughout the body. When the pituitary refuses to stop producing GH, the levels of IGF-1 also reach abnormal peaks. Bones, soft tissue, and organs throughout the body begin to enlarge, and the body changes its ability to process and use nutrients like sugars and fats.

In acromegaly, an individual's hands and feet begin to grow, becoming thick and doughy. The jaw line, nose, and forehead also grow, and facial features are described as "coarsening". The tongue grows larger, and because the jaw is larger, the teeth become more widely spaced. Due to swelling within the structures of the throat and sinuses, the voice becomes deeper and sounds more hollow, and patients may develop loud **snoring**. Various hormonal changes cause symptoms such as:

- heavy sweating
- oily skin
- increased coarse body hair
- improper processing of sugars in the diet (and sometimes actual diabetes)
- high blood pressure
- increased calcium in the urine (sometimes leading to kidney stones)
- increased risk of **gallstones**; and
- swelling of the thyroid gland

People with acromegaly have more skin tags, or outgrowths of tissue, than normal. This increase in skin tags is also associated with the development of growths, called polyps, within the large intestine that may eventually become cancerous. Patients with acromegaly often suffer from headaches and arthritis. The various swellings and enlargements throughout the body may press on nerves, causing sensations of local tingling or burning, and sometimes result in muscle weakness.

The most common cause of this disorder (in 90% of patients) is the development of a noncancerous tumor within the pituitary, called a pituitary adenoma. These tumors are the source of the abnormal release of GH. As these tumors grow, they may press on nearby structures within the brain, causing headaches and changes in vision. As the adenoma grows, it may disrupt other pituitary tissue, interfering with the release of other hormones. These disruptions may be responsible for changes in the menstrual cycle of women, decreases in the sexual drive in men and women, and the abnormal production of breast milk in women. In rare cases, acromegaly is caused by the abnormal production of GHRH, which leads to the increased production of GH. Certain tumors in the pancreas, lungs, adrenal glands, thyroid, and intestine produce GHRH, which in turn triggers production of an abnormal quantity of GH.

Diagnosis

Because acromegaly produces slow changes over time, diagnosis is often significantly delayed. In fact, the characteristic coarsening of the facial features is often not recognized by family members, friends, or long-time family physicians. Often, the diagnosis is suspected by a new physician who sees the patient for the first time and is struck by the patient's characteristic facial appearance. Comparing old photographs from a number of different time periods will often increase suspicion of the disease.

Because the quantity of GH produced varies widely under normal conditions, demonstrating high levels of GH in the blood is not sufficient to merit a diagnosis of acromegaly. Instead, laboratory tests measuring an



Enlarged feet is one deformity caused by acromegaly. (Custom Medical Stock Photo. Reproduced by permission.)

increase of IGF-1 (3-10 times above the normal level) are useful. These results, however, must be carefully interpreted because normal laboratory values for IGF-1 vary when the patient is pregnant, undergoing **puberty**, elderly, or severely malnourished. Normal patients will show a decrease in GH production when given a large dose of sugar (glucose). Patients with acromegaly will not show this decrease, and will often show an increase in GH production. **Magnetic resonance imaging** (MRI) is useful for viewing the pituitary, and for identifying and locating an adenoma. When no adenoma can be located, the search for a GHRH-producing tumor in another location begins.

Treatment

The first step in treatment of acromegaly is removal of all or part of the pituitary adenoma. Removal requires surgery, usually performed by entering the skull through the nose. While this surgery can cause rapid improvement of many acromegaly symptoms, most patients will also



A comparison of the right hand of a person afflicted with acromegaly (left) and the hand of a normal sized person.
(Custom Medical Stock Photo. Reproduced by permission.)

require additional treatment with medication. Bromocriptine (Parlodel) is a medication that can be taken by mouth, while octreotide (Sandostatin) must be injected every eight hours. Both of these medications are helpful in reducing GH production, but must often be taken for life and produce their own unique side effects. Some patients who cannot undergo surgery are treated with **radiation therapy** to the pituitary in an attempt to shrink the adenoma. Radiating the pituitary may take up to 10 years, however, and may also injure/destroy other normal parts of the pituitary.

Prognosis

Without treatment, patients with acromegaly will most likely die early because of the disease's effects on the heart, lungs, brain, or due to the development of **cancer** in the large intestine. With treatment, however, a patient with acromegaly may be able to live a normal lifespan.

Resources

BOOKS

- Billir, Beverly M. K., and Gilbert H. Daniels. "Growth Hormone Excess: Acromegaly and Gigantism." In *Harrison's Principles of Internal Medicine*, ed. Anthony S. Fauci, et al. New York: McGraw-Hill, 1997.
- Jameson, J. Larry. "Growth Hormone Excess: Acromegaly and Gigantism." In *Cecil Textbook of Medicine*, ed. J. Claude Bennett and Fred Plum. Philadelphia: W. B. Saunders Co., 1996.

PERIODICALS

- Jaffe, C. A. "Acromegaly: Recognition and Treatment." *Drugs* 47, no. 3 (1994): 425+.
- Krishna, A. Y. "Management of Acromegaly: A Review." *American Journal of Medical Science* 308, no. 6 (1994): 370+.
- Maugans, Todd, and Michael L. Coates. "Diagnosis and Treatment of Acromegaly." *American Family Physician* 52, no. 1 (July 1995): 207+.

KEY TERMS

Adenoma—A type of noncancerous (benign) tumor that often involves the overgrowth of certain cells found in glands.

Gland—A collection of cells that releases certain chemicals, or hormones, that are important to the functioning of other organs or body systems.

Hormone—A chemical produced in one part of the body that travels to another part of the body in order to exert an effect.

Hypothalamus—A structure within the brain responsible for a large number of normal functions throughout the body, including regulating sleep, temperature, eating, and sexual development. The hypothalamus also regulates the functions of the pituitary gland by directing the pituitary to stop or start production of its hormones.

Pituitary—A gland located at the base of the brain that produces a number of hormones, including those that regulate growth and reproductive functions. Overproduction of the pituitary hormone called growth hormone (GH) is responsible for the condition known as acromegaly.

ORGANIZATIONS

Pituitary Tumor Network Association. 16350 Ventura Blvd., #231, Encino, CA 91436. (805) 499-9973.

Rosalyn Carson-DeWitt, MD

ACT see **Alanine aminotransferase test**

ACTH test see **Adrenocorticotrophic hormone test**

Actinomyces israelii infection see **Actinomycosis**

Actinomycosis

Definition

Actinomycosis is an infection primarily caused by the bacterium *Actinomyces israelii*. Infection most often occurs in the face and neck region and is characterized by the presence of a slowly enlarging, hard, red lump.

Description

Actinomycosis is a relatively rare infection occurring in one out of 300,000(1/300,000) people per year. It is characterized by the presence of a lump or mass that often forms, draining sinus tracts to the skin surface. Fifty percent of actinomycosis cases are of the head and neck region (also called “lumpy jaw” and “cervicofacial actinomycosis”), 15% are in the chest, 20% are in the abdomen, and the rest are in the pelvis, heart, and brain. Men are three times more likely to develop actinomycosis than women.

Causes and symptoms

Actinomycosis is usually caused by the bacterium *Actinomyces israelii*. This bacterium is normally present in the mouth but can cause disease if it enters tissues following an injury. *Actinomyces israelii* is an anaerobic bacterium which means it dislikes oxygen but grows very well in deep tissues where oxygen levels are low. **Tooth extraction**, tooth disease, **root canal treatment**, jaw surgery, or poor dental hygiene can allow *Actinomyces israelii* to cause an infection in the head and neck region.

The main symptom of cervicofacial actinomycosis is the presence of a hard lump on the face or neck. The lump may or may not be red. **Fever** occurs in some cases.

Diagnosis

Cervicofacial actinomycosis can be diagnosed by a family doctor or dentist and the patient may be referred to an oral surgeon or infectious disease specialist. The diagnosis of actinomycosis is based upon several things. The presence of a red lump with draining sinuses on the head or neck is strongly suggestive of cervicofacial actinomycosis. A recent history of tooth extraction or signs of **tooth decay** or poor dental hygiene aid in the diagnosis. Microscopic examination of the fluid draining from the sinuses shows the characteristic “sulfur granules” (small yellow colored material in the fluid) produced by *Actinomyces israelii*. A biopsy may be performed to remove a sample of the infected tissue. This procedure can be performed under local anesthesia in the doctor’s office. Occasionally the bacteria can be cultured from the sinus tract fluid or from samples of the infected tissue.

Actinomycosis in the lungs, abdomen, pelvis, or brain can be very hard to diagnose since the symptoms often mimic those of other diseases. Actinomycosis of the lungs or abdomen can resemble **tuberculosis** or **cancer**. x-ray results, the presence of draining sinus tracts, and microscopic analysis and culturing of infected tissue assist in the diagnosis.

Treatment

Actinomycosis is difficult to treat because of its dense tissue location. Surgery is often required to drain

KEY TERMS

Biopsy—The process which removes a sample of tissue for microscopic examination to aid in the diagnosis of a disease.

Sinus tract—A narrow, elongated channel in the body which allows the escape of fluid.

the lesion and/or to remove the site of infection. To kill the bacteria, large doses of penicillin are given through a vein daily for two to six weeks followed by six to twelve months of penicillin taken by mouth. Tetracycline, clindamycin, or erythromycin may be used instead of penicillin. The antibiotic therapy must be completed to insure that the infection does not return. Hyperbaric oxygen (oxygen under high pressure) therapy in combination with the antibiotic therapy has been successful.

Prognosis

Complete recovery is achieved following treatment. If left untreated, the infection may cause localized bone destruction.

Prevention

The best prevention is to maintain good dental hygiene.

Resources

OTHER

“Actinomycosis.” HealthAnswers.com. 6 Feb. 1998. <<http://www.healthanswers.com/database/ami/converted/000599.html>>.

Belinda Rowland, PhD

Activated charcoal see **Charcoal, activated**

Activated partial thromboplastin time see **Partial thromboplastin time**

Acupressure

Definition

Acupressure is a form of touch therapy that utilizes the principles of **acupuncture** and Chinese medicine. In acupressure, the same points on the body are used as in acupuncture, but are stimulated with finger pressure



Therapist working acupressure points on a woman's shoulder. (Photo Researchers, Inc. Reproduced by permission.)

instead of with the insertion of needles. Acupressure is used to relieve a variety of symptoms and **pain**.

Purpose

Acupressure massage performed by a therapist can be very effective both as prevention and as a treatment for many health conditions, including headaches, general aches and pains, colds and flu, arthritis, **allergies**, **asthma**, nervous tension, menstrual cramps, sinus problems, sprains, **tennis elbow**, and toothaches, among others. Unlike acupuncture which requires a visit to a professional, acupressure can be performed by a layperson. Acupressure techniques are fairly easy to learn, and have been used to provide quick, cost-free, and effective relief from many symptoms. Acupressure points can also be stimulated to increase energy and feelings of well-being, reduce **stress**, stimulate the immune system, and alleviate **sexual dysfunction**.

Description

Origins

One of the oldest text of Chinese medicine is the *Huang Di*, The Yellow Emperor's Classic of Internal

Medicine, which may be at least 2,000 years old. Chinese medicine has developed acupuncture, acupressure, herbal remedies, diet, **exercise**, lifestyle changes, and other remedies as part of its healing methods. Nearly all of the forms of Oriental medicine that are used in the West today, including acupuncture, acupressure, **shiatsu**, and Chinese herbal medicine, have their roots in Chinese medicine. One legend has it that acupuncture and acupressure evolved as early Chinese healers studied the puncture **wounds** of Chinese warriors, noting that certain points on the body created interesting results when stimulated. The oldest known text specifically on acupuncture points, the *Systematic Classic of Acupuncture*, dates back to 282 A.D. Acupressure is the non-invasive form of acupuncture, as Chinese physicians determined that stimulating points on the body with massage and pressure could be effective for treating certain problems.

Outside of Asian-American communities, Chinese medicine remained virtually unknown in the United States until the 1970s, when Richard Nixon became the first U.S. president to visit China. On Nixon's trip, journalists were amazed to observe major operations being performed on patients without the use of anesthetics. Instead, wide-awake patients were being operated on,

with only acupuncture needles inserted into them to control pain. At that time, a famous columnist for the *New York Times*, James Reston, had to undergo surgery and elected to use acupuncture for anesthesia. Later, he wrote some convincing stories on its effectiveness. Despite being neglected by mainstream medicine and the American Medical Association (AMA), acupuncture and Chinese medicine became a central to alternative medicine practitioners in the United States. Today, there are millions of patients who attest to its effectiveness, and nearly 9,000 practitioners in all 50 states.

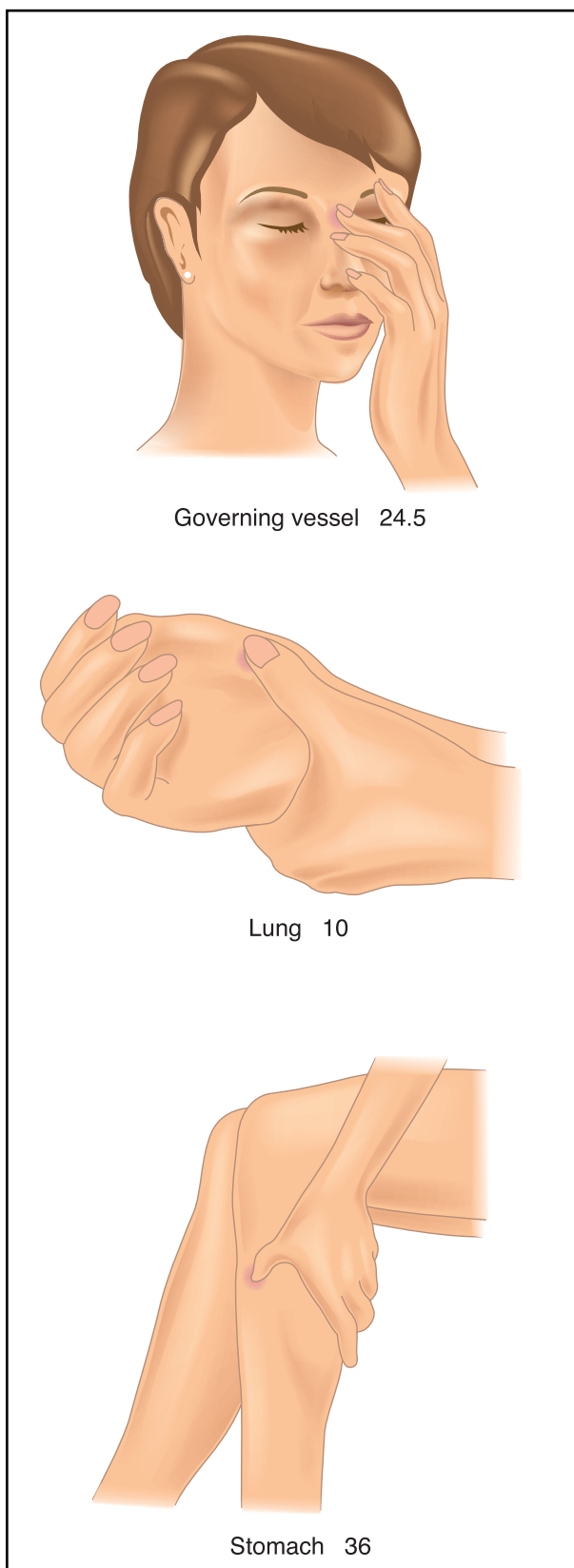
Acupressure is practiced as a treatment by Chinese medicine practitioners and acupuncturists, as well as by massage therapists. Most massage schools in American include acupressure techniques as part of their bodywork programs. Shiatsu massage is very closely related to acupressure, working with the same points on the body and the same general principles, although it was developed over centuries in Japan rather than in China. **Reflexology** is a form of bodywork based on acupressure concepts. Jin Shin Do is a bodywork technique with an increasing number of practitioners in America that combines acupressure and shiatsu principles with **qigong**, Reichian theory, and **meditation**.

Acupressure and Chinese medicine

Chinese medicine views the body as a small part of the universe, subject to laws and principles of harmony and balance. Chinese medicine does not make as sharp a distinction as Western medicine does between mind and body. The Chinese system believes that emotions and mental states are every bit as influential on disease as purely physical mechanisms, and considers factors like work, environment, and relationships as fundamental to a patient's health. Chinese medicine also uses very different symbols and ideas to discuss the body and health. While Western medicine typically describes health as mainly physical processes composed of chemical equations and reactions, the Chinese use ideas like yin and yang, chi, and the organ system to describe health and the body.

Everything in the universe has properties of yin and yang. Yin is associated with cold, female, passive, downward, inward, dark, wet. Yang can be described as hot, male, active, upward, outward, light, dry, and so on. Nothing is either completely yin or yang. These two principles always interact and affect each other, although the body and its organs can become imbalanced by having either too much or too little of either.

Chi (pronounced *chee*, also spelled *qi* or *ki* in Japanese shiatsu) is the fundamental life energy. It is found in food, air, water, and sunlight, and it travels through the body in channels called *meridians*. There are 12 major



Acupressure points to relieve hay fever, sore throat, and heartburn. (Illustration by Electronic Illustrators Group.)