GALE ENCYCLOPEDIA OF MEDICINE xxix

A

Abdominal aorta ultrasound see Abdominal

While pelvic ultrasound is widely known and com

ultrasound

Abdominal aortic aneurysm see Aortic aneurysm

Abdominal hernia see Hernia

Abdominal thrust see Heimlich maneuver

Abdominal ultrasound

Definition

Ultrasound technology allows doctors to ‘‘see’’ inside a patient without resorting to surgery. A trans mitter sends high frequency sound waves into the body, where they bounce off the different tissues and organs to produce a distinctive pattern of echoes. A receiver ‘‘hears’’ the returning echo pattern and forwards it to a computer, which translates the data into an image on a television screen. Because ultrasound can distinguish subtle variations between soft, fluid-filled tissues, it is particularly useful in providing diagnostic images of the abdomen. Ultrasound can also be used in treatment.

Purpose

The potential medical applications of ultrasound were first recognized in the 1940s as an outgrowth of the sonar technology developed to detect submarines during World War II. The first useful medical images were produced in the early 1950s, and, by 1965, ultra sound quality had improved to the point that it came into general medical use. Improvements in the tech nology, application, and interpretation of ultrasound continue. Its low cost, versatility, safety and speed have brought it into the top drawer of medical imaging techniques.

monly used for fetal monitoring during pregnancy, ultrasound is also routinely used for general abdom inal imaging. It has great advantage over x-ray ima ging technologies in that it does not damage tissues with ionizing radiation. Ultrasound is also generally far better than plain x rays at distinguishing the subtle variations of soft tissue structures, and can be used in any of several modes, depending on the need at hand.

As an imaging tool, abdominal ultrasound gener ally is warranted for patients afflicted with: chronic or acute abdominal pain; abdominal trauma; an obvious or suspected abdominal mass; symptoms of liver dis ease, pancreatic disease, gallstones, spleen disease, kid ney disease and urinary blockage; or symptoms of an abdominal aortic aneurysm. Specifically:

Abdominal pain. Whether acute or chronic, pain can signal a serious problem–from organ malfunction or injury to the presence of malignant growths. Ultrasound scanning can help doctors quickly sort through potential causes when presented with gen eral or ambiguous symptoms. All of the major abdominal organs can be studied for signs of disease that appear as changes in size, shape and internal structure.

Abdominal trauma. After a serious accident, such as a car crash or a fall, internal bleeding from injured abdominal organs is often the most serious threat to survival. Neither the injuries nor the bleeding are immediately apparent. Ultrasound is very useful as an initial scan when abdominal trauma is suspected, and it can be used to pinpoint the location, cause, and severity of hemorrhaging. In the case of punc ture wounds, from a bullet for example, ultrasound can locate the foreign object and provide a prelimin ary survey of the damage. The easy portability and versatility of ultrasound technology has brought it into common emergency room use, and even into limited ambulance service.

GALE ENCYCLOPEDIA OF MEDICINE 1

Abdominal ultrasound

Abdominal mass. Abnormal growths–tumors, cysts, abscesses, scar tissue and accessory organs–can be located and tentatively identified with ultrasound. In particular, potentially malignant solid tumors can be distinguished from benign fluid-filled cysts and abscesses. Masses and malformations in any organ or part of the abdomen can be found.

Liver disease. The types and underlying causes of liver disease are numerous, though jaundice tends to be a general symptom. Ultrasound can differenti ate between many of the types and causes of liver malfunction, and is particularly good at identifying obstruction of the bile ducts and cirrhosis, which is characterized by abnormal fibrous growths and reduced blood flow.

Pancreatic disease. Inflammation and malformation of the pancreas are readily identified by ultrasound, as are pancreatic stones (calculi), which can disrupt proper functioning.

Gallstones. Gallstones cause more hospital admissions than any other digestive malady. These calculi can cause painful inflammation of the gallbladder and also obstruct the bile ducts that carry digestive enzymes from the gallbladder and liver to the intestines. Gallstones are readily identifiable with ultrasound.

Spleen disease. The spleen is particularly prone to injury during abdominal trauma. It may also become painfully inflamed when beset with infection or cancer. These conditions also lend themselves well to ultrasonic inspection and diagnosis.

Kidney disease. The kidneys are also prone to trau matic injury and are the organs most likely to form calculi, which can block the flow of urine and cause blood poisoning (uremia). A variety of diseases causing distinct changes in kidney morphology can also lead to complete kidney failure. Ultrasound imaging has pro ven extremely useful in diagnosing kidney disorders.

Abdominal aortic aneurysm. This is a bulging weak spot in the abdominal aorta, which supplies blood directly from the heart to the entire lower body. These aneurysms are relatively common and increase in prevalence with age. A burst aortic aneurysm is imminently life-threatening. However, they can be readily identified and monitored with ultrasound before acute complications result.

Ultrasound technology can also be used for treat ment purposes, most frequently as a visual aid during surgical procedures–such as guiding needle placement to drain fluid from a cyst, or to extract tumor cells for biopsy. Increasingly, direct therapeutic applications for ultrasound are being developed.

The direct therapeutic value of ultrasonic waves lies in their mechanical nature. They are shock waves, just like audible sound, and vibrate the materials through which they pass. These vibrations are mild, virtually unnoticeable at the frequencies and intensi ties used for imaging. Properly focused however, high intensity ultrasound can be used to heat and physically agitate targeted tissues.

High-intensity ultrasound is used routinely to treat soft tissue injuries, such as strains, tears and associated scarring. The heating and agitation are believed to promote rapid healing through increased circulation. Strongly focused, high-intensity, high-frequency ultra sound can also be used to physically destroy certain types of tumors, as well as gallstones and other types of calculi. Developing new treatment applications for ultrasound is an active area of medical research.

Precautions

Properly performed, ultrasound imaging is vir tually without risk or side effects. Some patients report feeling a slight tingling and/or warmth while being scanned, but most feel nothing at all. Ultrasound waves of appropriate frequency and intensity are not known to cause or aggravate any medical condition, though any woman who thinks she might be pregnant should raise the issue with her doctor before under going an abdominal ultrasound.

The value of ultrasound imaging as a medical tool, however, depends greatly on the quality of the equip ment used and the skill of the medical personnel oper ating it. Improperly performed and/or interpreted, ultrasound can be worse than useless if it indicates that a problem exists where there is none, or fails to detect a significant condition. Basic ultrasound equip ment is relatively inexpensive to obtain, and any doc tor with the equipment can perform the procedure whether qualified or not. Patients should not hesitate to verify the credentials of technicians and doctors performing ultrasounds, as well as the quality of the equipment used and the benefits of the proposed procedure.

In cases where ultrasound is used as a treatment tool, patients should educate themselves about the proposed procedure with the help of their doctors–as is appropriate before any surgical procedure. Also, any abdominal ultrasound procedure, diagnostic or therapeutic, may be hampered by a patient’s body type or other factors, such as the presence of excessive bowel gas (which is opaque to ultrasound). In parti cular, very obese people are often not good candidates for abdominal ultrasound.

2 GALE ENCYCLOPEDIA OF MEDICINE

KEY TERMS

Abdominal ultrasound

Accessory organ—A lump of tissue adjacent to an organ that is similar to it, but which serves no impor tant purpose, if functional at all. While not necessa rily harmful, such organs can cause problems if they grow too large or become cancerous. In any case, their presence points to an underlying abnormality in the parent organ.

Benign—In medical usage, benign is the opposite of malignant. It describes an abnormal growth that is stable, treatable and generally not life-threatening. Biopsy— The surgical removal and analysis of a tissue sample for diagnostic purposes. Usually, the term refers to the collection and analysis of tissue from a suspected tumor to establish malignancy. Calculus—Any type of hard concretion (stone) in the body, but usually found in the gallbladder, pancreas and kidneys. They are formed by the accumulation of excess mineral salts and other organic material such as blood or mucous. Calculi (pl.) can cause problems by lodging in and obstructing the proper flow of fluids, such as bile to the intestines or urine to the bladder. Cirrhosis—A chronic liver disease characterized by the invasion of connective tissue and the degenera tion of proper functioning–jaundice is often an accompanying symptom. Causes of cirrhosis include alcoholism, metabolic diseases, syphilis and conges tive heart disease.

Common bile duct—The branching passage through which bile–a necessary digestive enzyme–travels from the liver and gallbladder into the small intes tine. Digestive enzymes from the pancreas also enter the intestines through the common bile duct.

Computed tomography scan (CT scan)—A specia lized type of x-ray imaging that uses highly focused and relatively low energy radiation to produce detailed two-dimensional images of soft tissue structures, parti cularly the brain. CT scans are the chief competitor to ultrasound and can yield higher quality images not disrupted by bone or gas. They are, however, more cumbersome, time consuming and expensive to per form, and they use ionizing electromagnetic radiation.

Description

Ultrasound includes all sound waves above the frequency of human hearing–about 20 thousand hertz, or cycles per second. Medical ultrasound gener ally uses frequencies between one and 10 million hertz

Doppler—The Doppler effect refers to the apparent change in frequency of sound wave echoes returning to a stationary source from a moving target. If the object is moving toward the source, the frequency increases; if the object is moving away, the fre quency decreases. The size of this frequency shift can be used to compute the object’s speed–be it a car on the road or blood in an artery. The Doppler effect holds true for all types of radiation, not just sound.

Frequency—Sound, whether traveling through air or the human body, produces vibrations–molecules bouncing into each other–as the shock wave travels along. The frequency of a sound is the number of vibrations per second. Within the audible range, frequency means pitch–the higher the frequency, the higher a sound’s pitch.

Ionizing radiation—Radiation that can damage liv ing tissue by disrupting and destroying individual cells at the molecular level. All types of nuclear radiation–x rays, gamma rays and beta rays–are potentially ionizing. Sound waves physically vibrate the material through which they pass, but do not ionize it.

Jaundice—A condition that results in a yellow tint to the skin, eyes and body fluids. Bile retention in the liver, gallbladder and pancreas is the immediate cause, but the underlying cause could be as simple as obstruction of the common bile duct by a gall stone or as serious as pancreatic cancer. Ultrasound can distinguish between these conditions.

Malignant—The term literally means growing worse and resisting treatment. It is used as a synonym for cancerous and connotes a harmful condition that generally is life-threatening.

Morphology—Literally, the study of form. In medi cine, morphology refers to the size, shape and struc ture rather than the function of a given organ. As a diagnostic imaging technique, ultrasound facilitates the recognition of abnormal morphologies as symp toms of underlying conditions.

(1-10 MHz). Higher frequency ultrasound waves pro duce more detailed images, but are also more readily absorbed and so cannot penetrate as deeply into the body. Abdominal ultrasound imaging is generally per formed at frequencies between 2-5 MHz.

GALE ENCYCLOPEDIA OF MEDICINE 3

Abdominal ultrasound

An ultrasound machine consists of two parts: the transducer and the analyzer. The transducer both pro duces the sound waves that penetrate the body and receives the reflected echoes. Transducers are built around piezoelectric ceramic chips. (Piezoelectric refers to electricity that is produced when you put pressure on certain crystals such as quartz). These ceramic chips react to electric pulses by producing sound waves ( they are transmitting waves) and react to sound waves by producing electric pulses (receiv ing). Bursts of high frequency electric pulses supplied to the transducer causes it to produce the scanning sound waves. The transducer then receives the return ing echoes, translates them back into electric pulses and sends them to the analyzer–a computer that orga nizes the data into an image on a television screen.

Because sound waves travel through all the body’s tissues at nearly the same speed–about 3,400 miles per hour–the microseconds it takes for each echo to be received can be plotted on the screen as a distance into the body. The relative strength of each echo, a func tion of the specific tissue or organ boundary that produced it, can be plotted as a point of varying brightness. In this way, the echoes are translated into a picture. Tissues surrounded by bone or filled with gas (the stomach, intestines and bowel) cannot be imaged using ultrasound, because the waves are blocked or become randomly scattered.

Four different modes of ultrasound are used in medical imaging:

A-mode. This is the simplest type of ultrasound in which a single transducer scans a line through the body with the echoes plotted on screen as a function of depth. This method is used to measure distances within the body and the size of internal organs. Therapeutic ultrasound aimed at a specific tumor or calculus is also A-mode, to allow for pinpoint accurate focus of the destructive wave energy.

B-mode. In B-mode ultrasound, a linear array of transducers simultaneously scans a plane through the body that can be viewed as a two-dimensional image on screen. Ultrasound probes containing more than 100 transducers in sequence form the basis for these most commonly used scanners, which cost about $50,000.

M-Mode. The M stands for motion. A rapid sequence of B-mode scans whose images follow each other in sequence on screen enables doctors to see and measure range of motion, as the organ boundaries that produce reflections move relative to the probe. M-mode ultrasound has been put to particular use in studying heart motion.

Doppler mode. Doppler ultrasonography includes the capability of accurately measuring velocities of mov ing material, such as blood in arteries and veins. The principle is the same as that used in radar guns that measure the speed of a car on the highway. Doppler capability is most often combined with B-mode scan ning to produce images of blood vessels from which blood flow can be directly measured. This technique is used extensively to investigate valve defects, arter iosclerosis and hypertension, particularly in the heart, but also in the abdominal aorta and the portal vein of the liver. These machines cost about $250,000.

The actual procedure for a patient undergoing an abdominal ultrasound is relatively simple, regardless of the type of scan or its purpose. Fasting for at least eight hours prior to the procedure ensures that the stomach is empty and as small as possible, and that the intestines and bowels are relatively inactive. Fasting also allows the gall bladder to be seen, as it contracts after eating and may not be seen if the sto mach is full. In some cases, a full bladder helps to push intestinal folds out of the way so that the gas they contain does not disrupt the image. The patient’s abdomen is then greased with a special gel that allows the ultrasound probe to glide easily across the skin while transmitting and receiving ultrasonic pulses.

This procedure is conducted by a doctor with the assistance of a technologist skilled in operating the equipment. The probe is moved around the abdomen to obtain different views of the target areas. The patient will likely be asked to change positions from side to side and to hold their breath as necessary to obtain the desired views. Discomfort during the pro cedure is minimal.

The many types and uses of ultrasound technol ogy makes it difficult to generalize about the time and costs involved. Relatively simple imaging–scanning a suspicious abdominal mass or a suspected abdominal aortic aneurysm–will take about half an hour to per form and will cost a few hundred dollars or more, depending on the quality of the equipment, the operator and other factors. More involved techniques such as multiple M-mode and Doppler-enhanced scans, or cases where the targets not well defined in advance, generally take more time and are more expensive.

Regardless of the type of scan used and the potential difficulties encountered, ultrasound remains faster and less expensive than computed tomography scans (CT), its primary rival in abdominal imaging. Furthermore, as abdominal ultrasounds are generally undertaken as

4 GALE ENCYCLOPEDIA OF MEDICINE

‘‘medically necessary’’ procedures designed to detect the presence of suspected abnormalities, they are covered under most types of major medical insurance. As always, though, the patient would be wise to confirm that their coverage extends to the specific procedure proposed. For nonemergency situations, most underwriters stipu late prior approval as a condition of coverage.

Specific conditions for which ultrasound may be selected as a treatment option–certain types of tumors, lesions, kidney stones and other calculi, muscle and ligament injuries, etc.–are described in detail under the appropriate entries in this encyclopedia.

Preparation

A patient undergoing abdominal ultrasound will be advised by their physician about what to expect and how to prepare. As mentioned above, preparations generally include fasting and arriving for the proce dure with a full bladder, if necessary. This preparation is particularly useful if the gallbladder, ovaries or veins are to be examined.

Aftercare

In general, no aftercare related to the abdominal ultrasound procedure itself is required.

Risks

Abdominal ultrasound carries with it no recog nized risks or side effects, if properly performed using appropriate frequency and intensity ranges. Sensitive tissues, particularly those of the reproductive organs, could possibly sustain damage if violently vibrated by overly intense ultrasound waves. In general though, such damage would only result from improper use of the equipment.

Any woman who thinks she might be pregnant should raise this issue with her doctor before under going an abdominal ultrasound, as a fetus in the early stages of development could be injured by ultrasound meant to probe deeply recessed abdominal organs.

Normal results

As a diagnostic imaging technique, a normal abdominal ultrasound is one that indicates the absence of the suspected condition that prompted the scan. For example, symptoms such as a persistent cough, labored breathing, and upper abdominal pain suggest the possibility of, among other things, an abdominal aortic aneurysm. An ultrasound scan that indicates the absence of an aneurysm would rule out this life

Abdominal wall defects

threatening condition and point to other, less serious causes.

Abnormal results

Because abdominal ultrasound imaging is gener ally undertaken to confirm a suspected condition, the results of a scan often will prove abnormal–that is they will confirm the diagnosis, be it kidney stones, cirrho sis of the liver or an aortic aneurysm. At that point, appropriate medical treatment as prescribed by a patient’s doctor is in order. See the relevant disease and disorder entries in this encyclopedia for more information.

Resources

PERIODICALS

Freundlich, Naomi. ‘‘Ultrasound: What’s Wrong with this Picture?’’ Business Week September 15, 1997:84-5.

ORGANIZATIONS

American College of Gastroenterology. 4900 B South 31st St., Arlington, VA 22206-1656. (703) 820-7400.

<http://www.acg.gi.org>.

American Institute of Ultrasound in Medicine. 14750 Sweitzer Lane, Suite 100, Laurel, MD 20707-5906. (800) 638-5352. <http://www.aium.org>.

American Society of Radiologic Technologists. 15000 Central Ave., SE, Albuquerque, NM 87123-3917. (505) 298-4500. <http://www.asrt.org>.

Kurt Richard Sternlof

Abdominal wall defects

Definition

Abdominal wall defects are birth (congenital) defects that allow the stomach or intestines to protrude.

Description

Many unexpected and fascinating events occur during the development of a fetus inside the womb. The stomach and intestines begin development outside the baby’s abdomen and only later does the abdominal wall enclose them. Occasionally, either the umbilical opening is too large, or it develops improperly, allow ing the bowels or stomach to remain outside or squeeze through the abdominal wall.

GALE ENCYCLOPEDIA OF MEDICINE 5

Abortion, partial birth

Causes and symptoms

There are many causes for birth defects that still remain unclear. Presently, the cause(s) of abdominal wall defects is unknown, and any symptoms the mother may have to indicate that the defects are pre sent in the fetus are nondescript.

Diagnosis

At birth, the problem is obvious, because the base of the umbilical cord at the navel will bulge or, in worse cases, contain viscera (internal organs). Before birth, an ultrasound examination may detect the pro blem. It is always necessary in children with one birth defect to look for others, because birth defects are usually multiple.

Treatment

Abdominal wall defects are effectively treated with surgical repair. Unless there are accompanying anomalies, the surgical procedure is not overly com plicated. The organs are normal, just misplaced. However, if the defect is large, it may be difficult to fit all the viscera into the small abdominal cavity.

Prognosis

If there are no other defects, the prognosis after surgical repair of this condition is relatively good. However, 10% of those with more severe or additional abnormalities die from it. The organs themselves are fully functional; the difficulty lies in fitting them inside the abdomen. The condition is, in fact, a hernia requiring only replacement and strengthening of the passageway through which it occurred. After surgery, increased pressure in the stretched abdomen can com promise the function of the organs inside.

Prevention

Some, but by no means all, birth defects are pre ventable by early and attentive prenatal care, good nutrition, supplemental vitamins, diligent avoidance of all unnecessary drugs and chemicals–especially tobacco–and other elements of a healthy lifestyle.

Resources

PERIODICALS

Dunn, J. C., and E. W. Fonkalsrud. ‘‘Improved Survival of Infantswith Omphalocele.’’ American Journal of

Surgery 173 (April 1997): 284-7.

J. Ricker Polsdorfer, MD

KEY TERMS

Hernia—Movement of a structure into a place it does not belong.

Umbilical—Referring to the opening in the abdom inal wall where the blood vessels from the placenta enter.

Viscera—Any of the body’s organs located in the chest or abdomen.

Abnormal heart rhythms see Arrhythmias

ABO blood typing see Blood typing and crossmatching

ABO incompatibility see Erythroblastosis fetalis

Abortion, habitual see Recurrent

miscarriage

Abortion, partial birth

Definition

Partial birth abortion is a method of late-term (after 20 weeks) abortion that terminates a pregnancy and results in the death and intact removal of a fetus. This procedure is most commonly referred to as intact dilatation and extraction (D & X). It occurs in a rare percentage of pregnancies.

Purpose

Partial birth abortion, or D&X, is performed to end a pregnancy and results in the death of a fetus, typically in the late second or third trimester. Although D&X is highly controversial, some physi cians argue that it has advantages that make it a pre ferable procedure in some circumstances. One perceived advantage is that the fetus is removed largely intact, allowing for better evaluation and autopsy of the fetus in cases of known fetal abnormal ities. Intact removal of the fetus also may carry a lower risk of puncturing the uterus or damaging the cervix. Another perceived advantage is that D&X ends the pregnancy without requiring the woman to go through labor, which may be less emotionally trau matic than other methods of late-term abortion. In

6 GALE ENCYCLOPEDIA OF MEDICINE

addition, D&X may offer a lower cost and shorter procedure time.

Precautions

Women considering D&X should be aware of the highly controversial nature of this procedure. A con troversy common to all late-term abortions is whether the fetus is viable, or able to survive outside of the woman’s body. A specific area of controversy with D&X is that fetal death does not occur until after most of the fetal body has exited the uterus. Several states have taken legal action to limit or ban D&X and many physicians who perform abortions do not per form D&X. This may restrict the availability of this procedure to women seeking late-term abortions.

In March 2003, the United States Senate passed a bill banning partial birth abortions and implementing fines or maximum two-year jail terms for physicians who perform them. In June 2003, the House approved a ban as well. President George W. Bush signed the legislation into law, but a federal judge declared the law unconstitutional, so that the government had not been able to enforce it. One of the opponents’ claims was the legislation did not provide for exceptions for cases in which the procedure was needed to protect the mother’s health.

Description

Intact D&X, or partial birth abortion first involves administration of medications to cause the cervix to dilate, usually over the course of several days. Next, the physician rotates the fetus to a footling breech position. The body of the fetus is then drawn out of the uterus feet first, until only the head remains inside the uterus. Then, the physician uses an instru ment to puncture the base of the skull, which collapses the fetal head. Typically, the contents of the fetal head are then partially suctioned out, which results in the death of the fetus and reduces the size of the fetal head enough to allow it to pass through the cervix. The dead and otherwise intact fetus is then removed from the woman’s body.

Preparation

Medical preparation for D&X involves an out patient visit to administer medications, such as lami naria, to cause the cervix to begin dilating.

In addition, preparation may involve fulfilling local legal requirements, such as a mandatory waiting period, counseling, or an informed consent procedure

Abortion, partial birth

KEY TERMS

Cervix—The narrow outer end of the uterus that separates the uterus from the vaginal canal.

Footling breech—A position of the fetus while in the uterus where the feet of the fetus are nearest the cervix and will be the first part of the fetus to exit the uterus, with the head of the fetus being the last part to exit the uterus.

Laminaria—A medical product made from a cer tain type of seaweed that is physically placed near the cervix to cause it to dilate.

reviewing stages of fetal development, childbirth, alter native abortion methods, and adoption.

Aftercare

D&X typically does not require an overnight hos pital stay, so a follow up appointment may be sched uled to monitor the woman for any complications.

Risks

With all abortion, the later in pregnancy an abor tion is performed, the more complicated the procedure and the greater the risk of injury to the woman. In addition to associated emotional reactions, D&X car ries the risk of injury to the woman, including heavy bleeding, blood clots, damage to the cervix or uterus, pelvic infection, and anesthesia-related complications. There also is a risk of incomplete abortion, meaning that the fetus is not dead when removed from the woman’s body. Possible long-term risks include diffi culty becoming pregnant or carrying a future preg nancy to term.

Normal results

The expected outcome of D&X is the termination of a pregnancy with removal of a dead fetus from the woman’s body.

Resources

PERIODICALS

‘‘Court Rules Abortion Ban Unconstitutional.’’ Medicine & Health (June 7, 2004): 4–6.

‘‘House Approves Partial Birth Abortion Ban.’’ Medicine and Health (June 16, 2003): 5.

‘‘Partial-birth Abortion Ban Approved by Senate.’’ Medical Ethics Advisor (April 2003): 47.

GALE ENCYCLOPEDIA OF MEDICINE 7

Abortion, selective

ORGANIZATIONS

Planned Parenthood Federation of America, Inc.. 810 Seventh Ave., New York, NY 10019. (800) 669-0156. <http://www.plannedparenthood.org>.

OTHER

Status of partial-birth abortion laws in the states. Othmer Institute at Planned Parenthood of NYC. 2000.

Stefanie B. N. Dugan, M.S.

Teresa G. Odle

Abortion, selective

Definition

Selective abortion, also known as selective reduc tion, refers to choosing to abort a fetus, typically in a multi-fetal pregnancy, to decrease the health risks to the mother in carrying and giving birth to more than one or two babies, and also to decrease the risk of complications to the remaining fetus(es). The term selective abortion also refers to choosing to abort a fetus for reasons such as the woman is carrying a fetus which likely will be born with some birth defect or impairment, or because the sex of the fetus is not preferred by the individual.

Purpose

A woman may decide to abort for health reasons, for example, she is at higher risk for complications during pregnancy because of a disorder or disease such as diabetes. A 2004 case reported on an embryo embedded in a cesarean section scar. Although rare, it can be life threatening to the mother. In this care, selective abortion was successful at saving the mother and the remaining embryos.

However, selective reduction is recommended often in cases of multi-fetal pregnancy, or the presence of more than one fetus, typically, at least three or more fetuses. In the general population, multi-fetal preg nancy happens in only about 1-2% of pregnant women. But multi-fetal pregnancies occur far more often in women using fertility drugs.

Precautions

Because women or couples who use fertility drugs have made an extra effort to become pregnant, it is possible that the individuals may be unwilling or uncomfortable with the decision to abort a fetus in

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 remain ing fetuses and decrease health risks to the mother.

cases of multi-fetal pregnancy. Individuals engaging in fertility treatment should be made aware of the risk of multi-fetal pregnancy and consider the prospect of recommended reduction before undergoing fertility treatment.

Description

Selective reduction is usually performed between nine and 12 weeks of pregnancy and is most successful when performed in early pregnancy. It is a simple procedure and can be performed on an outpatient basis. A needle is inserted into the woman’s stomach or vagina and potassium chloride is injected into the fetus.

Preparation

Individuals who have chosen selective reduction to safeguard the remaining fetuses should be coun seled prior to the procedure. Individuals should receive information regarding the risks of a multi fetal pregnancy to both the fetuses and the mother compared with the risks after the reduction.

Individuals seeking an abortion for any reason should consider the ethical implications whether it be because the fetus is not the preferred sex or because the fetus would be born with a severe birth defect.

Aftercare

Counseling should continue after the abortion because it is a traumatic event. Individuals may feel guilty about choosing one fetus over another. Mental health professionals should be consulted throughout the process.

Risks

About 75% of women who undergo selective reduction will go into premature labor. About 4-5% of women undergoing selective reduction also

8 GALE ENCYCLOPEDIA OF MEDICINE

miscarry one or more of the remaining fetuses. The risks associated with multi-fetal pregnancy are consid ered higher.

Normal results

In cases where a multi-fetal pregnancy of three or more fetuses is reduced to two fetuses, the remaining twin fetuses typically develop as they would if they had been conceived as twins.

Resources

PERIODICALS

‘‘Multiple Pregnancy Associated With Infertility Therapy.’’ American Society for Reproductive Medicine, A Practice Committee Report (November 2000): 1-8.

‘‘Selective Reduction Eleiminates an Emryo Embedded in a Cesarean Scar.’’ WomenÆs Health Weekly (April 8, 2004): 117.

ORGANIZATIONS

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

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

Meghan M. Gourley

Teresa G. Odle

Abortion, spontaneous see Miscarriage

Abortion, therapeutic

Definition

Therapeutic abortion is the intentional termina tion of a pregnancy before the fetus can live indepen dently. 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

Abortion, therapeutic

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 pres sure, 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 psycho logical 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 tak ing 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

GALE ENCYCLOPEDIA OF MEDICINE 9

Abortion, therapeutic

Uterus

Embryonic

tissue

Vagina Vulsellum

Speculum

Cervix

Extraction tube

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.)

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 reac tions 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, caus ing a disease known as Rh disease. Sensitization to the disease occurs when the women’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.

emergency contraception get nauseated and 20 percent vomit.Thismethodcuts the riskof pregnancy 75percent.

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 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 incom plete 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:

10 GALE ENCYCLOPEDIA OF MEDICINE

The procedure is non-invasive; no surgical instru ments 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 proceduremay requiremultiple 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 neces sary 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 pro gesterone, a hormone needed for pregnancy to con tinue, then stimulates ulerine 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 abor tion. Within 14 days, 95-97% of women have com pleted 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.

Abortion, therapeutic

Studies show that 4.5 to 8 percent of women need surgery or a blood transfusion after taking mifepris tone, and the pregnancy persists in about 1 percent of women. In this case, surgical abortion is recom mended because the fetus may be damanged. 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 abnormal ities 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 proce dure 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.

GALE ENCYCLOPEDIA OF MEDICINE 11

Abortion, therapeutic

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 is it 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 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 pros taglandins 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, vomit ing, 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 prohibits 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 coun seling 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.

12 GALE ENCYCLOPEDIA OF MEDICINE

severe pain

fever over 100.4 8F (38.2 8C)

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 compli cation 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.

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 tis sues. In most cases, the germ produces similar chemi cals. The result is a thick, yellow liquid–pus–

Abscess

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

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 cir culation 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

GALE ENCYCLOPEDIA OF MEDICINE 13

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 anat omy that carries eggs from the ovaries to the uterus. Flora—Living inhabitants of a region or area. Pyogenic—Capable of generating pus. Streptococcus, Staphocococcus, 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.

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.

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 (sebac eous 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.

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], tubercu losis, 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, red ness, swelling, and pain–easily identify superficial abscesses. Abscesses in other places may produce only generalized symptoms such as fever and discom fort. If the patient’s symptoms and physical examina tion 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.

14 GALE ENCYCLOPEDIA OF MEDICINE

Treatment

Since skin is very resistant to the spread of infec tion, 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 rela tively 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 homeo pathic 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 prog nosis 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 blood stream, 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

Abscess incision & drainage

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

Fauci, Anthony S., et al., editors. Harrison’s Principles of Internal Medicine. 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 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.

GALE ENCYCLOPEDIA OF MEDICINE 15

Abscess incision & drainage

Liver

Common sites of abscess

above and below the liver

Spleen

Stomach

Colon

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.)

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 treat ment 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

16 GALE ENCYCLOPEDIA OF MEDICINE

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

Abuse

Description

Physical abuse of a child is the infliction of injury by another person. The injuries can include punching, kicking, biting, burning, beating, or pulling the vic tim’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 approxi mately three million children witness domestic vio lence 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, geni tals, and buttocks; either dressed or undressed. The behavior also can include exhibitionism, cunnilingus, fellatio, or penetration of the vagina or anus with sexual organs or objects.

Pornographic photography also is used in sexual abuse with children. Reported sex offenders are 97% male. Reports of child pornography have increased since with the popularity of the Internet. Females more often are perpetrators in child-care settings, since children may confuse sexual abuse by a female with normal hygiene care. The 1990s and early 2000s were rocked by reports of sexual abuse of children committed by Catholic priests. Most of the abuse appeared to have occurred during the 1970s and a prominent report released early in 2004 stated that as many as 10.667 children were sexually abused by more than 4,300 priests. 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 also can 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 sub stance usage leading to significant distress or impair ment. The criteria include one or more of the following occurring within a 12-month period:

GALE ENCYCLOPEDIA OF MEDICINE 17

Abuse

KEY TERMS

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

recurrent substance use resulting in failure to fulfill obligations at home, work, or school.

using substance in situations that are physically dan gerous (i.e., while driving).

recurrent substance-related legal problems.

continued usage despite recurrent social and inter personal problems (i.e., arguments and fights with significant other).

Abuse of 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 med ical care. Elderly patients also may 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, emo tional, and psychosomatic problems (body problems caused by emotional or mental disturbance). 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 dis order. Physically abused children may complain of physical illness even in the absence of a cause. They also may suffer from eating disorders and encopresis, or involuntary defecation caused or psychic origin. Children who are sexually abused may exhibit abnor mal sexual behavior in the form of aggressiveness and hyperarousal. Adolescents may display promiscuity, sexual acting out, and—in some situations—homo sexual contact.

Physical abuse directed towards adults can ulti mately 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 unconsciousness than victims of stranger assault (mugging, robbery). Physical abuse or rape also can 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 sexu ally assaulted persons were also physically abused in the form of punching, beating, or threatening the vic tim with a weapon such as a gun or knife. Usually males who are hurt and humiliated tend to physically assault people 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 a women’s movements and whereabouts and to isolate other sources of pro tection and support. They interpret their behavior as betrayal of trust and this causes resentment and explo sive anger outbursts during periods of losing control. Males also may 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 perpe trator. 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 frequently are injured attempting to protect their mother from an abusive partner. Injuries are visible by inspection or self-report. Physical abuse of an adult may 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 signs of ejaculatory evidence from the perpetrator. Ejaculatory specimens can be retrieved from the mouth, rectum, and clothing. Tests for sexu ally transmitted diseases may be performed.

18 GALE ENCYCLOPEDIA OF MEDICINE

Elderly abuse can be suspected if the elderly patient demonstrates a fear of the caretaker. Additionally, elderly abuse can be suspected if there are signs indicat ing 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 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 agency that will initiate investigations. The authorities usually will follow up the allegation or offense. Children may also be referred for psychological evaluation and/or treat ment. The victim also may be placed in foster care pending the investigation outcome. The police also may investigate physical and sexual abuse of an adult. The victim may require immediate medical care and long-term psychological treatment. It is com mon 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 psy chological 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 enter abusive rela tionships or have problems with intimacy as adults. 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.

Acetaminophen

Prevention

Prevention programs are geared to education and awareness. Detection of initial symptoms or charac teristic 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, editors. Nelson Textbook of Pediatrics. 16th ed. W. B. Saunders Company, 2000.

PERIODICALS

Plante, Thomas G. ‘‘Another Aftershock: What Have We Learned from the John Jay Report?.’’ America (March 22, 2004): 10.

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.

Teresa G. Odle

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.

GALE ENCYCLOPEDIA OF MEDICINE 19

Acetaminophen

Description

This drug is available without a prescription. Acetaminophen 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. The ingredi ents listing on the container should state if acetamino phen 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 four to six 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 acetamino phen 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. A physician should recommend doses for children under age 6 years.

Precautions

In 2004, the U.S. Food and Drug Administration (FDA) launched an advertising campaign aimed at educating consumers about proper use of acetamino phen and other over-the-counter pain killers. Often, acetaminophen is hidden in many cold and flu products and people unexpectedly overdose on the medicine. Some cases have led to liver transplantation or death. More than the recommended dosage of acetaminophen should not be taken unless told to do so by a physician or dentist.

Patients should not use acetaminophen for more than 10 days to relieve pain (five days for children) or for more than three days to reduce fever, unless direc ted to do so by a physician. If symptoms do not go away—or if they get worse— a physician should be contacted. 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

KEY TERMS

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

Fatigue—Physical or mental weariness.

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

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.

Many drugs can interact with one another. A physician or pharmacist should be consulted before combining acetaminophen with any other medicine. Two different acetaminophen-containing products should not be used at the same time.

Acetaminophen interferes with the results of some medical tests. 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 occur in some people, but 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 bruis ing, 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 over doses can cause liver damage. In case of an overdose, immediate medical attention should be sought. In 2004, researchers announced that an injection to coun teract the liver injury caused by acetaminophen over dose has been approved by the FDA.

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

20 GALE ENCYCLOPEDIA OF MEDICINE

anti-inflammatory drugs (NSAIDs) such as Motrin, oral contraceptives, the antiseizure drug phenytoin (Dilantin), the blood-thinning drug warfarin (Coumadin), the cholesterol-lowering drug cholesty ramine (Questran), the antibiotic Isoniazid, and zido vudine (Retrovir, AZT). A physician or pharmacist should be consulted before combining acetaminophen with any other prescription or nonprescription (over the-counter) medicine.

Resources

PERIODICALS

‘‘Antidote Cleared for Acetiminophen Overdose.’’ Drug Topics February 23, 2004: 12.

Mechcatie, Elizabeth. ‘‘FDA Launches Campaign About OTC Drug Risks: NSAIDs, Acetaminophen.’’ Family Practice News March 15, 2004: 8l

Nancy Ross-Flanigan

Teresa G. Odle

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 sto mach 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, peristal sis 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.

Achalasia

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 med ical history. The history should focus on the timing of symptoms and on eliminating other medical condi tions 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 sphinc ter 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.

GALE ENCYCLOPEDIA OF MEDICINE 21

Achondroplasia

KEY TERMS

Botulinum toxin—Any of a group of potent bacter ial 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 esopha gus by means of a flexible tube. Endoscopy per mits 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 esopha gus 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.

Botulinum toxin injection. Injected into the sphinc ter, 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 effec tively. Achalasia does not reduce life expectancy unless esophageal carcinoma develops.

Prevention

There is no known way to prevent achalasia.

Resources

BOOKS

Grendell, James H., Kenneth R. McQuaid, and Scott L. Friedman, editors. 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.

Description

Achondroplasia is one of a number of chondo dystrophies, 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 produc tion of cartilage (a fibrous connective tissue). Over time, calcium is deposited within the cartilage, causing it to harden and become bone. In achon droplasia, 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 thick ened. 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 (ver tebrae) 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%

22 GALE ENCYCLOPEDIA OF MEDICINE

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

chance of passing it 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 develop ment of the face in the area of the upper jaw. Because the foramen magnum and spinal canal are abnor mally narrowed, nerve damage may occur if the spinal cord or nerves become compressed. The nar rowed 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 achondro plasia 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 capa city, or reproductive ability.

Achondroplasia

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 struc ture of a gene, which can result in abnormal struc ture 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 col umn which are stacked on top of each other. There is a hole in the center of each bone, through which the spinal cord passes.

Diagnosis

Diagnosis is often made at birth due to the char acteristically short limbs, and the appearance of a large head. X-ray examination will reveal a character istic 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, hydro cephalus, 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 monitor ing in order to avoid hearing loss.

Prognosis

Achondroplasia is a disease which causes consid erable deformity. However, with careful attention

GALE ENCYCLOPEDIA OF MEDICINE 23

Acid phosphatase test

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

Krane, Stephen M., and Alan L. Schiller.

‘‘Achondroplasia.’’ In Harrison’s Principles of Internal Medicine, edited by Anthony S. Fauci, et al. New York: McGraw-Hill, 1997.

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 reac tions. 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.

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.

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 phos phatase 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 phospha tase from the prostate, called prostatic acid phospha tase (PAP), is the most medically significant type of acid phosphatase.

Subtle differences between prostatic acid phos phatase 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 inhi bits 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.

24 GALE ENCYCLOPEDIA OF MEDICINE

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

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 (March 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.

Acne

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 wor sens 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 con sists 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 sur rounding tissues. Inflamed pimples near the skin’s sur face 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 men struation, during pregnancy, and menopause.

GALE ENCYCLOPEDIA OF MEDICINE 25

Acne

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 produc

tion 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.

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.)

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 con traceptives, and anabolic steroids.

Personal hygiene. Abrasive soaps, hard scrubbing, or picking at pimples will make them worse.

Cosmetics. Oil-based makeup and hair sprays wor sen 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 infla med 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 specia list who treats diseases of the body’s endocrine (hor mones 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 deter mines what types and how many blemishes are pre sent, whether they are inflamed, whether they are deep or superficial, and whether there is scarring or skin discoloration.

26 GALE ENCYCLOPEDIA OF MEDICINE

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 pro duction, removing dead skin cells, and killing bacteria with topical drugs and oral medications. Treatment choice depends upon whether the acne is mild, mod erate, or severe.

Drugs

TOPICAL DRUGS. Treatment for mild noninflam matory 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 (Benzamycin), 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, dry ness, 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,

Acne

erythromycin, minocycline (Minocin), doxycycline, clindamycin (Cleocin), and trimethoprim- sulfamethox azole (Bactrim, Septra). Possible side effects include allergic reactions, stomach upset, vaginal yeast infec tions, 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 or oral antibiotic. A combination of topical benzoyl peroxide and erythromycin is also very effec tive. 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 antibio tics. 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 anti biotics. 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 pro duction, are used to treat women who are unrespon sive 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, spir onolactone 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 avail able to alleviate acne or the resulting scars:

Comedone extraction. The comedo is removed from the pore with a special tool.

GALE ENCYCLOPEDIA OF MEDICINE 27

Acoustic neuroma

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 isotre tinoin. 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

PERIODICALS

Billings, Laura. ‘‘Getting Clear.’’ Health Magazine (April 1997): 48-52.

ORGANIZATIONS

American Academy of Dermatology. 930 N. Meacham Road, P.O. Box 4014, Schaumburg, IL 60168-4014. (847) 330-0230. Fax: (847) 330-0050. <http:// www.aad.org>.

Mercedes McLaughlin

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 vestibu locochlear 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 vestib ular 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 con cerning 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

28 GALE ENCYCLOPEDIA OF MEDICINE

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 any where 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 uni lateral tumor is a tumor arising from one nerve and a bilateral tumor arises from both vestibular nerves. Unilateral acoustic neuromas usually occur sponta neously (by chance). Bilateral acoustic neuromas occur as part of a hereditary condition called Neurofibromatosis Type 2 (NF2). A person with NF2 has inherited a predisposition for develop ing 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 symp toms. As the acoustic neuroma grows it can inter fere 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 con tinues 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

Acoustic neuroma

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 pro duction 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 bilat eral 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 control ling 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.

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

GALE ENCYCLOPEDIA OF MEDICINE 29

Acoustic neuroma

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 some one 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 neu roma 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 vestibu locochlear 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 unilat eral 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.

Recent studies in Europe have suggested a possi ble connection between the widespread use of mobile phones and an increased risk of developing acoustic neuromas. Some observers, however, question whether mobile phones have been in use long enough to be an identifiable risk factor.

Symptoms

Small acoustic neuromas usually only interfere with the functioning of the vestibulocochlear nerve. The most common first symptom of an acoustic neu roma is hearing loss, which is often accompanied by a ringing sound (tinnitis). People with acoustic neuro mas 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 approxi mately 10% of cases the hearing loss is sudden and severe.

Acoustic neuromas can also affect the function ing of the vestibular branch of the vestibulocochlear nerve and van 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 character ized 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 numb ness. Compression of the seventh cranial nerve can cause spasms, weakness or 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 cra nial 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.

30 GALE ENCYCLOPEDIA OF MEDICINE

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 recog nize 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, some times 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 neces sary to confirm the presence of a tumor.

If an acoustic neuroma is strongly suspected then magnetic resonance imaging (MRI) is usually per formed. 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 eva luation 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 sus pected 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.

Acoustic neuroma

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 possi bility, 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 com plications. 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 tinnitis often result from the sur gery. 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 out patient 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; however, as of the early 2000s, more and more patients diagnosed with acoustic neuromas are choosing this form of therapy. Periodic MRI monitoring throughout the life of the patient is therefore recommended.

Radiation therapy can cause hearing loss which can sometimes occurs even years later. Radiation ther apy can also cause damage to neighboring cranial

GALE ENCYCLOPEDIA OF MEDICINE 31

Acrocyanosis

nerves, which can result in symptoms such as numb ness, pain or paralysis of the facial muscles. In many cases these symptoms are temporary. Radiation treat ment can also induce the formation of other benign or malignant schwannomas. This type of treatment may therefore be contraindicated in the treatment of acous tic 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 appropri ate for example in an elderly person with a small acoustic neuroma and few symptoms. Periodic obser vation 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 some one 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 tinnitis in the affected ear are common, even if appropriate treat ment is provided. Many patients also experience facial weakness, balance problems, and headaches. 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

Beers, Mark H., MD, and Robert Berkow, MD., editors. ‘‘Acoustic Neuroma.’’ Section 7, Chapter 85 In The Merck Manual of Diagnosis and Therapy. Whitehouse Station, NJ: Merck Research Laboratories, 2002.

PERIODICALS

Kondziolka, D., L. D. Lundsford, and J. C. Flickinger. ‘‘Acoustic Neuroma Radiosurgery. Origins,

Contemporary Use and Future Expectations.’’

Neurochirurgie 50 (June 2004): 427–435.

Kundi, M., K. Mild, L. Hardell, and M. O. Mattsson. ‘‘Mobile Telephones and Cancer—A Review of Epidemiological Evidence.’’ Journal of Toxicology and Environmental Health, Part B, Critical Reviews 7 (September-October 2004): 351–384.

Ryzenman, J. M., M. L. Pensak, and J. M. Tew, Jr. ‘‘Patient Perception of Comorbid Conditions After Acoustic Neuroma Management: Survey Results from the Acoustic Neuroma Association.’’ Laryngoscope 114 (May 2004): 814–820.

ORGANIZATIONS

Acoustic Neuroma Association. 600 Peachtree Pkwy, Suite 108, Cumming, GA 30041-6899. (770) 205-8211. Fax: (770) 205-0239. ANAusa@aol.com. [cited June 28, 2001]. <http://anausa.org>.

Acoustic Neuroma Association of Canada Box 369, Edmonton, AB T5J 2J6. 1-800-561-ANAC(2622). (780)428-3384. anac@compusmart.ab.ca. [cited June 28, 2001]. <http://www.anac.ca>.

Seattle Acoustic Neuroma Group. Emcityland@aol.com. [cited June 28, 2001]. <http://acousticneuromaseat tle.org/entryenglish.html>.

OTHER

National Institute of Health Consensus Statement Online. Acoustic Neuroma 9, no. 4 (December 11-13, 1991). [cited June 28, 2001]. <http://text.nlm.nih.gov/nih/cdc/ www/87txt.html>.

University of California at San Francisco (UCSF). Information on Acoustic Neuromas. March 18, 1998. [cited June 28, 2001]. <http://itsa.ucsf.edu/~rkj/ IndexAN.html>.

Lisa Andres, MS, CGC

Rebecca J. Frey, PhD

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.

32 GALE ENCYCLOPEDIA OF MEDICINE

Description

Acrocyanosis is a painless disorder caused by con striction 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 symp toms, while warmth can decrease symptoms. The dis ease 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 sur face 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 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.

Acromegaly and gigantism

KEY TERMS

Sympathetic nerve—A nerve of the autonomic ner vous system that regulates involuntary and auto matic reactions, especially to stress.

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, editors. The Heart. 9th ed. New York: McGraw-Hill, 1998.

John T. Lohr, PhD

Acromegaly and gigantism

Definition

Acromegaly is a disorder in which the abnor mal release of a particular chemical from the pitui tary 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 gradu ally, diagnosis is often delayed. The majority of patients are not identified until they are middle aged.

GALE ENCYCLOPEDIA OF MEDICINE 33

Acromegaly and gigantism

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

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 hor mones. 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.

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 func tions. Overproduction of the pituitary hormone called growth hormone (GH) is responsible for the condition known as acromegaly.

In acromegaly, the pituitary continues to release GH and ignores signals from the hypothalamus. In the liver, GH causes production of a hormone called insu lin-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 some times actual diabetes)

34 GALE ENCYCLOPEDIA OF MEDICINE

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 acro megaly 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 dis rupt other pituitary tissue, interfering with the release of other hormones. These disruptions may be respon sible 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 character istic 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 mea suring an increase of IGF-1 (3-10 times above the normal level) are useful. These results, however, must

Acromegaly and gigantism

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.)

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 produc tion 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 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 redu cing 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

GALE ENCYCLOPEDIA OF MEDICINE 35

Actinomycosis

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

Biller, Beverly M. K., and Gilbert H. Daniels. ‘‘Growth Hormone Excess: Acromegaly and Gigantism.’’ In Harrison’s Principles of Internal Medicine, edited by Anthony S. Fauci, et al. New York: McGraw-Hill, 1997.

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 Adrenocorticotropic

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 char acterized 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.

KEY TERMS

Biopsy—The process that removes a sample of tis sue for microscopic examination to aid in the diag nosis of a disease.

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

Causes and symptoms

Actinomycosis is usually caused by the bacterium Actinomyces israelii. This bacterium is normally pre sent 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 underlocal 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

36 GALE ENCYCLOPEDIA OF MEDICINE

of the lungs or abdomen can resemble tuberculosis or cancer. Diagnostic 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 the lesion and/or to remove the site of infec tion. To kill the bacteria, standard therapy has included large doses of penicillin 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 ensure that the infection does not return. However, a report in 2004 on several cases of actinomycosis said that therapy depends on the individual case and that many patients today will be diagnosed in earlier stages of the disease. Sometimes, shorter courses of anti biotic treatment are effective, with close diagnostic x-ray monitoring. Hyperbaric oxygen (oxygen under high pressure) therapy in combination with the antibiotic therapy has been successful.

Prognosis

Complete recovery is achieved following treat ment. If left untreated, the infection may cause loca lized bone destruction.

Prevention

The best prevention is to maintain good dental hygiene.

Resources

PERIODICALS

Sudhaker, Selvin S., and John J. Rose. ‘‘Short-term Treatment of Actinomycosis: two Cases and a Review.’’ Clinical Infectious Diseases (February 1, 2004): 444–448.

Belinda Rowland, PhD

Teresa G. Odle

Activated charcoal see Charcoal, activated

Activated partial thromboplastin time see Partial thromboplastin time

Acupressure

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 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, men strual 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 tech niques 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, acupres sure, 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, acu pressure, 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 war riors, 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.

GALE ENCYCLOPEDIA OF MEDICINE 37

Acupressure

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

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 anes thetics. Instead, wide-awake patients were being oper ated 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 medi cine became a central to alternative medicine practi tioners 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 body work 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 destinction 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, envi ronment, and relationships as fundamental to a patient’s health. Chinese medicine also uses very dif ferent symbols and ideas to discuss the body and

38 GALE ENCYCLOPEDIA OF MEDICINE

Governing vessel 24.5 Lung 10

Stomach 36

Acupressure

KEY TERMS

Acupoint—A pressure point stimulated in acupressure.

Chi—Basic life energy.

Meridian—A channel through which chi travels in the body.

Moxibustion—An acupuncture technique that burns the herb moxa or mugwort.

Shiatsu—Japanese form of acupressure massage. Yin/yang—Universal characteristics used to describe aspects of the natural world.

health. While Western medicine typically describes health as mainly physical processes composed of che mical 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 meridians in the body that transport chi, corresponding to the 12 main organs categorized by Chinese medicine.

Disease is viewed as an imbalance of the organs and chi in the body. Chinese medicine has developed intricate systems of how organs are related to physical and mental symptoms, and it has devised correspond ing treatments using the meridian and pressure point networks that are classified and numbered. The goal

Press on point governing vessel 24.5, the top of the bridge of the nose, lightly for two minutes to relieve hay fever symptoms. Press on lung 10, the center of the thumb pad, for one minute to alleviate a sore throat. To ease heartburn, apply pressure to stomach 36, four finger-widths below the kneecap outside the shinbone. Use on both legs. (Illustration by Electronic Illustrators Group.)

GALE ENCYCLOPEDIA OF MEDICINE 39

Acupressure

of acupressure, and acupuncture, is to stimulate and unblock the circulation of chi, by activating very spe cific points, called pressure points or acupoints. Acupressure seeks to stimulate the points on the chi meridians that pass close to the skin, as these are easiest to unblock and manipulate with finger pressure.

Acupressure can be used as part of a Chinese physician’s prescription, as a session of massage ther apy, or as a self-treatment for common aches and ill nesses. A Chinese medicine practitioner examines a patient very thoroughly, looking at physical, mental and emotional activity, taking the pulse usually at the wrists, examining the tongue and complexion, and observing the patient’s demeanor and attitude, to get a complete diagnosis of which organs and meridian points are out of balance. When the imbalance is located, the physician will recommend specific pres sure points for acupuncture or acupressure. If acupres sure is recommended, the patient might opt for a series of treatments from a massage therapist.

In massage therapy, acupressurists will evaluate a patient’s symptoms and overall health, but a massage therapist’s diagnostic training isn’t as extensive as a Chinese physician’s. In a massage therapy treatment, a person usually lies down on a table or mat, with thin clothing on. The acupressurist will gently feel and palpate the abdomen and other parts of the body to determine energy imbalances. Then, the therapist will work with different meridians throughout the body, depending on which organs are imbalanced in the abdomen. The therapist will use different types of finger movements and pressure on different acupoints, depending on whether the chi needs to be increased or dispersed at different points. The therapist observes and guides the energy flow through the patient’s body throughout the session. Sometimes, special herbs (Artemesia vulgaris or moxa) may be placed on a point to warm it, a process called moxibustion. A ses sion of acupressure is generally a very pleasant experi ence, and some people experience great benefit immediately. For more chronic conditions, several sessions may be necessary to relieve and improve conditions.

Acupressure massage usually costs from $30–70 per hour session. A visit to a Chinese medicine physi cian or acupuncturist can be more expensive, compar able to a visit to an allopathic physician if the practitioner is an MD. Insurance reimbursement var ies widely, and consumers should be aware if their policies cover alternative treatment, acupuncture, or massage therapy.

Self-treatment

Acupressure is easy to learn, and there are many good books that illustrate the position of acupoints and meridians on the body. It is also very versatile, as it can be done anywhere, and it’s a good form of treatment for spouses and partners to give to each other and for parents to perform on children for minor conditions.

While giving self-treatment or performing acu pressure on another, a mental attitude of calmness and attention is important, as one person’s energy can be used to help another’s. Loose, thin clothing is recommended. There are three general techniques for stimulating a pressure point.

Tonifying is meant to strengthen weak chi, and is done by pressing the thumb or finger into an acu point with a firm, steady pressure, holding it for up to two minutes.

Dispersing is meant to move stagnant or blocked chi, and the finger or thumb is moved in a circular motion or slightly in and out of the point for two minutes.

Calming the chi in a pressure point utilizes the palm to cover the point and gently stroke the area for about two minutes.

There are many pressure points that are easily found and memorized to treat common ailments from headaches to colds.

For headaches, toothaches, sinus problems, and pain in the upper body, the ‘‘LI4’’ point is recom mended. It is located in the web between the thumb and index finger, on the back of the hand. Using the thumb and index finger of the other hand, apply a pinching pressure until the point is felt, and hold it for two minutes. Pregnant women should never press this point.

To calm the nerves and stimulate digestion, find the ‘‘CV12’’ point that is four thumb widths above the navel in the center of the abdomen. Calm the point with the palm, using gentle stroking for several minutes.

To stimulate the immune system, find the ‘‘TH5’’ point on the back of the forearm two thumb widths above the wrist. Use a dispersing technique, or cir cular pressure with the thumb or finger, for two minutes on each arm.

For headaches, sinus congestion, and tension, locate the ‘‘GB20’’ points at the base of the skull in the back of the head, just behind the bones in back of

40 GALE ENCYCLOPEDIA OF MEDICINE

the ears. Disperse these points for two minutes with the fingers or thumbs. Also find the ‘‘yintang’’ point, which is in the middle of the forehead between the eyebrows. Disperse it with gentle pressure for two minutes to clear the mind and to relieve headaches.

Precautions

Acupressure is a safe technique, but it is not meant to replace professional health care. A physician should always be consulted when there are doubts about medical conditions. If a condition is chronic, a profes sional should be consulted; purely symptomatic treat ment can exacerbate chronic conditions. Acupressure should not be applied to open wounds, or where there is swelling and inflammation. Areas of scar tissue, blisters, boils, rashes, or varicose veins should be avoided. Finally, certain acupressure points should not be stimulated on people with high or low blood pressure and on pregnant women.

Research and general acceptance

In general, Chinese medicine has been slow to gain acceptance in the West, mainly because it rests on ideas very foreign to the scientific model. For instance, Western scientists have trouble with the idea of chi, the invisible energy of the body, and the idea that pressing on certain points can alleviate certain conditions seems sometimes too simple for scientists to believe.

Western scientists, in trying to account for the action of acupressure, have theorized that chi is actu ally part of the neuroendocrine system of the body. Celebrated orthopedic surgeon Robert O. Becker, who was twice nominated for the Nobel Prize, wrote a book on the subject called Cross Currents: The Promise of Electromedicine; The Perils of Electro pollution. By using precise electrical measuring devices, Becker and his colleagues showed that the body has a complex web of electromagnetic energy, and that traditional acupressure meridians and points contained amounts of energy that non-acupressure points did not.

The mechanisms of acupuncture and acupres sure remain difficult to document in terms of the biochemical processes involved; numerous testi monials are the primary evidence backing up the effectiveness of acupressure and acupuncture. However, a body of research is growing that veri fies the effectiveness in acupressure and acupunc ture techniques in treating many problems and in controlling pain.

Acupuncture

Resources

PERIODICALS

Massage Therapy Journal. 820 Davis Street, Suite100, Evanston, IL 60201-4444.

OTHER

American Association of Oriental Medicine.December 28, 2000. <http://www.aaom.org>.

National Acupuncture and Oriental Medicine Alliance. December 28, 2000. <http://www.acuall.org>.

Douglas Dupler, MA

Acupressure, foot see Reflexology

Acupuncture

Definition

Acupuncture is one of the main forms of treat ment in traditional Chinese medicine. It involves the use of sharp, thin needles that are inserted in the body at very specific points. This process is believed to adjust and alter the body’s energy flow into healthier patterns, and is used to treat a wide variety of illnesses and health conditions.

Purpose

The World Health Organization (WHO) recom mends acupuncture as an effective treatment for over forty medical problems, including allergies, respira tory conditions, gastrointestinal disorders, gynecolo gical problems, nervous conditions, and disorders of the eyes, nose and throat, and childhood illnesses, among others. Acupuncture has been used in the treatment of alcoholism and substance abuse. It is an effective and low-cost treatment for headaches and chronic pain, associated with problems like back injuries and arthritis. It has also been used to supplement invasive Western treatments like chemotherapy and surgery. Acupuncture is generally most effective when used as prevention or before a health condition becomes acute, but it has been used to help patients suffering from cancer and AIDS. Acupuncture is limited in treating conditions or traumas that require surgery or emergency care (such as for broken bones).

GALE ENCYCLOPEDIA OF MEDICINE 41

Acupuncture

Woman undergoing facial acupuncture. (Photograph by Yoav Levy. Phototake NYC. Reproduced by permission.)

Description

Origins

The original text of Chinese medicine is the Nei Ching, The Yellow Emperor’s Classic of Internal Medicine, which is estimated to be at least 2,500 years old. Thousands of books since then have been written on the subject of Chinese healing, and its basic philo sophies spread long ago to other Asian civilizations. Nearly all of the forms of Oriental medicine which are used in the West today, including acupuncture, shiatsu, acupressure massage, and macrobiotics, are part of or have their roots in Chinese medicine. Legend has it that acupuncture developed when early Chinese physicians observed unpredicted effects of puncture wounds in Chinese warriors. The oldest known text on acupunc ture, the Systematic Classic of Acupuncture, dates back to 282 A.D. Although acupuncture is its best known technique, Chinese medicine traditionally utilizes her bal remedies, dietary therapy, lifestyle changes and other means to treat patients.

In the early 1900s, only a few Western physicians who had visited China were fascinated by acupuncture,

but outside of Asian-American communities it remained virtually unknown 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 con trol pain. During that time, a famous columnist for the New York Times, James Reston, had to undergo surgery and elected to use acupuncture instead of pain medication, and he wrote some convincing stories on its effectiveness.

Today, acupuncture is being practiced in all 50 states by over 9,000 practitioners, with over 4,000 MDs including it in their practices. Acupuncture has shown notable success in treating many conditions, and over 15 million Americans have used it as a ther apy. Acupuncture, however, remains largely unsup ported by the medical establishment. The American Medical Association has been resistant to researching it, as it is based on concepts very different from the Western scientific model.

42 GALE ENCYCLOPEDIA OF MEDICINE

Governor vessel

Bladder meridian

Triple burner meridian

Small intestine meridian

Acupuncture sites and meridians on the face and neck. (Illustration by Hans & Cassady.)

Acupuncture

Conception vessel

Stomach meridian

Large intestine meridian

Gallbladder meridian

KEY TERMS

Acupressure—Form of massage using acupuncture points.

Auricular acupuncture—Acupuncture using only points found on the ears.

Chi—Basic life energy.

Meridian—Channel through which chi travels in the body.

Moxibustion—Acupuncture technique which burns the herb moxa or mugwort.

Tonification—Acupuncture technique for strength ening the body.

Yin/Yang—Universal characteristics used to describe aspects of the natural world.

Several forms of acupuncture are being used today in America. Japanese acupuncture uses extre mely thin needles and does not incorporate herbal medicine in its practice. Auricular acupuncture uses acupuncture points only on the ear, which are

believed to stimulate and balance internal organs. In France, where acupuncture is very popular and more accepted by the medical establishment, neuro logist Paul Nogier developed a system of acupuncture based on neuroendocrine theory rather than on tra ditional Chinese concepts, which is gaining some use in America.

Basic ideas of Chinese medicine

Chinese medicine views the body as a small part of the universe, and subject to universal laws and principles of harmony and balance. Chinese medicine does not draw a sharp line, 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, life style and relationships as fundamental to the overall picture of 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 in terms of measurable physical processes made up of chemical reactions, the Chinese use ideas like yin and yang, chi, the organ system, and

GALE ENCYCLOPEDIA OF MEDICINE 43

Acupuncture

the five elements to describe health and the body. To understand the ideas behind acupuncture, it is worth while to introduce some of these basic terms.

YIN AND YANG. According to Chinese philosophy, the universe and the body can be described by two separate but complementary principles, that of yin and yang. For example, in temperature, yin is cold and yang is hot. In gender, yin is female and yang is male. In activity, yin is passive and yang is active. In light, yin is dark and yang is bright; in direction yin is inward and downward and yang is outward and up, and so on. Nothing is ever completely yin or yang, but a combination of the two. These two principles are always interacting, opposing, and influencing each other. The goal of Chinese medicine is not to eliminate either yin or yang, but to allow the two to balance each other and exist harmoniously together. For instance, if a person suffers from symptoms of high blood pressure, the Chinese system would say that the heart organ might have too much yang, and would recommend methods either to reduce the yang or to increase the yin of the heart, depending on the other symptoms and organs in the body. Thus, acupuncture therapies seek to either increase or reduce yang, or increase or reduce yin in particular regions of the body.

CHI. Another fundamental concept of Chinese medicine is that of chi (pronounced chee, also spelled qi). Chi is the fundamental life energy of the universe. It is invisible and is found in the environment in the air, water, food and sunlight. In the body, it is the invisible vital force that creates and animates life. We are all born with inherited amounts of chi, and we also get acquired chi from the food we eat and the air we breathe. The level and quality of a person’s chi also depends on the state of physical, mental and emotional balance. Chi travels through the body along channels called meridians.

THE ORGAN SYSTEM. In the Chinese system, there are twelve main organs: the lung, large intestine, sto mach, spleen, heart, small intestine, urinary bladder, kidney, liver, gallbladder, pericardium, and the ‘‘triple warmer,’’ which represents the entire torso region. Each organ has chi energy associated with it, and each organ interacts with particular emotions on the mental level. As there are twelve organs, there are twelve types of chi which can move through the body, and these move through twelve main channels or mer idians. Chinese doctors connect symptoms to organs. That is, symptoms are caused by yin/yang imbalances in one or more organs, or by an unhealthy flow of chi to or from one organ to another. Each organ has a different profile of symptoms it can manifest.

THE FIVE ELEMENTS. Another basis of Chinese the ory is that the world and body are made up of five main elements: wood, fire, earth, metal, and water. These elements are all interconnected, and each ele ment either generates or controls another element. For instance, water controls fire and earth generates metal. Each organ is associated with one of the five elements. The Chinese system uses elements and organs to describe and treat conditions. For instance, the kidney is associated with water and the heart is associated with fire, and the two organs are related as water and fire are related. If the kidney is weak, then there might be a corresponding fire problem in the heart, so treat ment might be made by acupuncture or herbs to cool the heart system and/or increase energy in the kidney system.

The Chinese have developed an intricate system of how organs and elements are related to physical and mental symptoms, and the above example is a very simple one. Although this system sounds suspect to Western scientists, some interesting parallels have been observed. For instance, Western medicine has observed that with severe heart problems, kidney fail ure often follows, but it still does not know exactly why. In Chinese medicine, this connection between the two organs has long been established.

MEDICAL PROBLEMS AND ACUPUNCTURE. In Chinese medicine, disease as seen as imbalances in the organ system or chi meridians, and the goal of any remedy or treatment is to assist the body in rees tablishing its innate harmony. Disease can be caused by internal factors like emotions, external factors like the environment and weather, and other factors like injuries, trauma, diet, and germs. However, infection is seen not as primarily a problem with germs and viruses, but as a weakness in the energy of the body which is allowing a sickness to occur. In Chinese med icine, no two illnesses are ever the same, as each body has its own characteristics of symptoms and balance. Acupuncture is used to open or adjust the flow of chi throughout the organ system, which will strengthen the body and prompt it to heal itself.

A VISIT TO THE ACUPUNCTURIST. The first thing an acupuncturist will do is get a thorough idea of a patient’s medical history and symptoms, both physi cal and emotional. This is done with a long question naire and interview. Then the acupuncturist will examine the patient to find further symptoms, look ing closely at the tongue, the pulse at various points in the body, the complexion, general behavior, and other signs like coughs or pains. From this, the practitioner will be able to determine patterns of

44 GALE ENCYCLOPEDIA OF MEDICINE

symptoms which indicate which organs and areas are imbalanced. Depending on the problem, the acu puncturist will insert needles to manipulate chi on one or more of the twelve organ meridians. On these twelve meridians, there are nearly 2,000 points which can be used in acupuncture, with around 200 points being most frequently used by traditional acupunc turists. During an individual treatment, one to twenty needles may be used, depending on which meridian points are chosen.

Acupuncture needles are always sterilized and acupuncture is a very safe procedure. The depth of insertion of needles varies, depending on which chi channels are being treated. Some points barely go beyond superficial layers of skin, while some acupunc ture points require a depth of 1-3 in (2.5-7.5 cm) of needle. The needles generally do not cause pain. Patients sometimes report pinching sensations and often pleasant sensations, as the body experiences healing. Depending on the problem, the acupuncturist might spin or move the needles, or even pass a slight electrical current through some of them. Moxibustion may be sometimes used, in which an herbal mixture (moxa or mugwort) is either burned like incense on the acupuncture point or on the end of the needle, which is believed to stimulate chi in a particular way. Also, acupuncturists sometimes use cupping, during which small suction cups are placed on meridian points to stimulate them.

How long the needles are inserted also varies. Some patients only require a quick in and out inser tion to clear problems and provide tonification (strengthening of health), while some other condi tions might require needles inserted up to an hour or more. The average visit to an acupuncturist takes about thirty minutes. The number of visits to the acupuncturist varies as well, with some conditions improved in one or two sessions and others requiring a series of six or more visits over the course of weeks or months.

Costs for acupuncture can vary, depending on whether the practitioner is an MD. Initial visits with non-MD acupuncturists can run from $50- $100, with follow-up visits usually costing less. Insurance reimbursement also varies widely, depend ing on the company and state. Regulations have been changing often. Some states authorize Medicaid to cover acupuncture for certain conditions, and some states have mandated that general coverage pay for acupuncture. Consumers should be aware of the provisions for acupuncture in their individual policies.

Acupuncture

Precautions

Acupuncture is generally a very safe procedure. If a patient is in doubt about a medical condition, more than one physician should be consulted. Also, a patient should always feel comfortable and confident that their acupuncturist is knowledgable and properly trained.

Research and general acceptance

Mainstream medicine has been slow to accept acupuncture; although more MDs are using it, the American Medical Association does not recognize it as a specialty. The reason for this is that the mechanism of acupuncture is difficult to scientifi cally understand or measure, such as the invisible energy of chi in the body. Western medicine, admitting that acupuncture works in many cases, has theorized that the energy meridians are actu ally part of the nervous system and that acupunc ture relieves pain by releasing endorphins, or natural pain killers, into the bloodstream. Despite the ambiguity in the biochemistry involved, acu puncture continues to show effectiveness in clinical tests, from reducing pain to alleviating the symp toms of chronic illnesses, and research in acupunc ture is currently growing. The Office of Alternative Medicine of the National Institute of Health is currently funding research in the use of acupunc ture for treating depression and attention-deficit disorder.

Resources

PERIODICALS

American Journal of Acupuncture. 1840 41st Ave., Suite 102, P.O. Box 610, Capitola, CA 95010.

OTHER

American Association of Oriental Medicine. December 28, 2000. <http://www.aaom.org>.

North American Society of Acupuncture and Alternative Medicine. December 28, 2000. <http://www.

nasa-altmed.com>.

Douglas Dupler, MA

Acute glomerulonephritis see Acute post streptococcal glomerulonephritis

Acute homeopathic remedies see

Homeopathic remedies, acute prescribing

GALE ENCYCLOPEDIA OF MEDICINE 45

Acute kidney failure

Acute kidney failure

Definition

Acute kidney failure occurs when illness, infec tion, or injury damages the kidneys. Temporarily, the kidneys cannot adequately remove fluids and wastes from the body or maintain the proper level of certain kidney-regulated chemicals in the bloodstream.

Description

The kidneys are the body’s natural filtration system. They perform the critical task of proces sing approximately 200 quarts of fluid in the bloodstream every 24 hours. Waste products like urea and toxins, along with excess fluids, are removed from the bloodstream in the form of urine. Kidney (or renal) failure occurs when kidney functioning becomes impaired. Fluids and toxins begin to accumulate in the bloodstream. As fluids build up in the bloodstream, the patient with acute kidney failure may become puffy and swollen (ede matous) in the face, hands, and feet. Their blood pressure typically begins to rise, and they may experience fatigue and nausea.

Unlike chronic kidney failure, which is long term and irreversible, acute kidney failure is a temporary condition. With proper and timely treat ment, it can typically be reversed. Often there is no permanent damage to the kidneys. Acute kidney failure appears most frequently as a complication of serious illness, like heart failure, liver failure, dehydration, severe burns, and excessive bleeding (hemorrhage). It may also be caused by an obstruction to the urinary tract or as a direct result of kidney disease, injury, or an adverse reaction to a medicine.

Causes and symptoms

Acute kidney failure can be caused by many differ ent illnesses, injuries, and infections. These conditions fall into three main categories: prerenal, postrenal, and intrarenal conditions.

Prerenal conditions do not damage the kidney, but can cause diminished kidney function. They are the most common cause of acute renal failure, and include:

dehydration

hemorrhage

septicemia, or sepsis

KEY TERMS

Blood urea nitrogen (BUN)—A waste product that is formed in the liver and collects in the blood stream; patients with kidney failure have high BUN levels.

Creatinine—A protein produced by muscle that healthy kidneys filter out.

Extracorporeal—Outside of, or unrelated to, the body.

Ischemia—A lack of blood supply to an organ or tissue.

Nephrotoxic—Toxic, or damaging, to the kidney. Radiocontrast agents—Dyes administered to a patient for the purposes of a radiologic study. Sepsis—A bacterial infection of the bloodstream. Vasopressors—Medications that constrict the blood vessels.

heart failure

liver failure

burns

Postrenal conditions cause kidney failure by obstructing the urinary tract. These conditions include:

inflammation of the prostate gland in men (prostatitis)

enlargement of the prostate gland (benign prostatic hypertrophy)

bladder or pelvic tumors

kidney stones (calculi)

Intrarenal conditions involve kidney disease or direct injury to the kidneys. These conditions include:

lack of blood supply to the kidneys (ischemia)

use of radiocontrast agents in patients with kidney problems

drug abuse or overdose

long-term use of nephrotoxic medications, like cer tain pain medicines

acute inflammation of the glomeruli, or filters, of the kidney (glomerulonephritis)

kidney infections (pyelitis or pyelonephritis).

46 GALE ENCYCLOPEDIA OF MEDICINE

Common symptoms of acute kidney failure include:

anemia. The kidneys are responsible for producing erythropoietin (EPO), a hormone that stimulates red blood cell production. If kidney disease causes shrinking of the kidney, red blood cell production is reduced, leading to anemia.

bad breath or bad taste in mouth. Urea in the saliva may cause an ammonia-like taste in the mouth.

bone and joint problems. The kidneys produce vitamin D, which helps the body absorb calcium and keeps bones strong. For patients with kidney failure, bones may become brittle. In children, normal growth may be stunted. Joint pain may also occur as a result of high phosphate levels in the blood. Retention of uric acid may cause gout.

edema. Puffiness or swelling in the arms, hands, feet, and around the eyes.

frequent urination.

foamy or bloody urine. Protein in the urine may cause it to foam significantly. Blood in the urine may indicate bleeding from diseased or obstructed kidneys, bladder, or ureters.

headaches. High blood pressure may trigger headaches.

hypertension, or high blood pressure. The retention of fluids and wastes causes blood volume to increase. This makes blood pressure rise.

increased fatigue. Toxic substances in the blood and the presence of anemia may cause the patient to feel exhausted.

itching. Phosphorus, normally eliminated in the urine, accumulates in the blood of patients with kidney failure. An increased phosphorus level may cause the skin to itch.

lower back pain. Patients suffering from certain kid ney problems (like kidney stones and other obstruc tions) may have pain where the kidneys are located, in the small of the back below the ribs.

nausea. Urea in the gastric juices may cause upset stomach.

Diagnosis

Kidney failure is diagnosed by a doctor. A nephrologist, a doctor that specializes in the kid ney, may be consulted to confirm the diagnosis and recommend treatment options. The patient that is suspected of having acute kidney failure will have

Acute kidney failure

blood and urine tests to determine the level of kidney function. A blood test will assess the levels of creatinine, blood urea nitrogen (BUN), uric acid, phosphate, sodium, and potassium. The kid ney regulates these agents in the blood. Urine sam ples will also be collected, usually over a 24-hour period, to assess protein loss and/or creatinine clearance.

Determining the cause of kidney failure is critical to proper treatment. A full assessment of the kidneys is necessary to determine if the underlying disease is treatable and if the kidney failure is chronic or acute. X rays, magnetic resonance imaging (MRI), computed tomography scan (CT), ultrasound, renal biopsy, and/or arteriogram of the kidneys may be used to determine the cause of kidney failure and level of remaining kidney function. X rays and ultra sound of the bladder and/or ureters may also be needed.

Treatment

Treatment for acute kidney failure varies. Treatment is directed to the underlying, primary med ical condition that has triggered kidney failure. Prerenal conditions may be treated with replacement fluids given through a vein, diuretics, blood transfusion, or medications. Postrenal conditions and intrarenal conditions may require surgery and/or medication.

Frequently, patients in acute kidney failure require hemodialysis, hemofiltration, or peritoneal dialysis to filter fluids and wastes from the blood stream until the primary medical condition can be controlled.

Hemodialysis

Hemodialysis involves circulating the patient’s blood outside of the body through an extracorporeal circuit (ECC), or dialysis circuit. The ECC is made up of plastic blood tubing, a filter known as a dialyzer (or artificial kidney), and a dialysis machine that monitors and maintains blood flow and administers dialysate. Dialysate is a sterile chemical solution that is used to draw waste products out of the blood. The patient’s blood leaves the body through the vein and travels through the ECC and the dialyzer, where fluid removal takes place.

During dialysis, waste products in the blood stream are carried out of the body. At the same time, electrolytes and other chemicals are added to the blood. The purified, chemically-balanced blood is then returned to the body.

GALE ENCYCLOPEDIA OF MEDICINE 47

Acute kidney failure

A dialysis ‘‘run’’ typically lasts three to four hours, depending on the type of dialyzer used and the physical condition of the patient. Dialysis is used several times a week until acute kidney failure is reversed.

Blood pressure changes associated with hemodia lysis may pose a risk for patients with heart problems. Peritoneal dialysis may be the preferred treatment option in these cases.

Hemofiltration

Hemofiltration, also called continuous renal replacement therapy (CRRT), is a slow, continuous blood filtration therapy used to control acute kidney failure in critically ill patients. These patients are typically very sick and may have heart problems or circulatory problems. They cannot handle the rapid filtration rates of hemodialysis. They also frequently need antibiotics, nutrition, vasopressors, and other fluids given through a vein to treat their primary condition. Because hemofiltration is continuous, prescription fluids can be given to patients in kidney failure without the risk of fluid overload.

Like hemodialysis, hemofiltration uses an ECC. A hollow fiber hemofilter is used instead of a dialyzer to remove fluids and toxins. Instead of a dialysis machine, a blood pump makes the blood flow through the ECC. The volume of blood circulating through the ECC in hemofiltration is less than that in hemo dialysis. Filtration rates are slower and gentler on the circulatory system. Hemofiltration treatment will generally be used until kidney failure is reversed.

Peritoneal dialysis

Peritoneal dialysis may be used if an acute kidney failure patient is stable and not in immediate crisis. In peritoneal dialysis (PD), the lining of the patient’s abdomen, the peritoneum, acts as a blood filter. A flexible tube-like instrument (catheter) is surgically inserted into the patient’s abdomen. During treat ment, the catheter is used to fill the abdominal cavity with dialysate. Waste products and excess fluids move from the patient’s bloodstream into the dialysate solution. After a certain time period, the waste-filled dialysate is drained from the abdomen, and replaced with clean dialysate. There are three type of peritoneal dialysis, which vary according to treatment time and administration method.

Peritoneal dialysis is often the best treatment option for infants and children. Their small size can make vein access difficult to maintain. It is not recom mended for patients with abdominal adhesions or

other abdominal defects (like a hernia) that might reduce the efficiency of the treatment. It is also not recommended for patients who suffer frequent bouts of an inflammation of the small pouches in the intest inal tract (diverticulitis).

Prognosis

Because many of the illnesses and underlying conditions that often trigger acute kidney failure are critical, the prognosis for these patients many times is not good. Studies have estimated overall death rates for acute kidney failure at 42-88%. Many people, however, die because of the primary disease that has caused the kidney failure. These figures may also be misleading because patients who experience kidney failure as a result of less serious illnesses (like kidney stones or dehydration) have an excellent chance of complete recovery. Early recognition and prompt, appropriate treat ment are key to patient recovery.

Up to 10% of patients who experience acute kidney failure will suffer irreversible kidney damage. They will eventually go on to develop chronic kidney failure or end-stage renal disease. These patients will require long-term dialysis or kidney transplantation to replace their lost renal functioning.

Prevention

Since acute kidney failure can be caused by many things, prevention is difficult. Medications that may impair kidney function should be given cautiously. Patients with pre-existing kidney conditions who are hospitalized for other illnesses or injuries should be carefully monitored for kidney failure complications. Treatments and procedures that may put them at risk for kidney failure (like diagnostic tests requiring radio contrast agents or dyes) should be used with extreme caution.

Resources

PERIODICALS

Stark, June. ‘‘Dialysis Choices: Turning the Tide in Acute Renal Failure.’’ Nursing 27, no. 2 (February 1997): 41-8.

ORGANIZATIONS

National Kidney Foundation. 30 East 33rd St., New York, NY 10016. (800) 622-9010. <http://www.kidney.org>.

Paula Anne Ford-Martin

Acute leukemias see Leukemias, acute

48 GALE ENCYCLOPEDIA OF MEDICINE

Acute lymphangitis

Definition

Acute lymphangitis is a bacterial infection in the lymphatic vessels which is characterized by painful, red streaks below the skin surface. This is a potentially serious infection which can rapidly spread to the bloodstream and be fatal.

Description

Acute lymphangitis affects a critical member of the immune system–the lymphatic system. Waste materials from nearly every organ in the body drain into the lymphatic vessels and are filtered in small organs called lymph nodes. Foreign bodies, such as bacteria or viruses, are processed in the lymph nodes to generate an immune response to fight an infection.

In acute lymphangitis, bacteria enter the body through a cut, scratch, insect bite, surgical wound, or other skin injury. Once the bacteria enter the lympha tic system, they multiply rapidly and follow the lym phatic vessel like a highway. The infected lymphatic vessel becomes inflamed, causing red streaks that are visible below the skin surface. The growth of the bac teria occurs so rapidly that the immune system does not respond fast enough to stop the infection.

If left untreated, the bacteria can cause tissue destruction in the area of the infection. A pus-filled, painful lump called an abscess may be formed in the infected area. Cellulitis, a generalized infection of the lower skin layers, may also occur. In addition, the bacteria may invade the bloodstream and cause septicemia. Lay people, for that reason, often call the red streaks seen in the skin ‘‘blood poisoning.’’ Septicemia is a very serious illness and may be fatal.

Causes and symptoms

Acute lymphangitis is most often caused by the bacterium Streptococcus pyogenes. This potentially dangerous bacterium also causes strep throat, infec tions of the heart, spinal cord, and lungs, and in the 1990s has been called the ‘‘flesh-eating bacterium.’’ Staphylococci bacteria may also cause lymphangitis.

Although anyone can develop lymphangitis, some people are more at risk. People who have had radical mastectomy (removal of a breast and nearby lymph nodes), a leg vein removed for coronary bypass sur gery, or recurrent lymphangitis caused by tinea pedis (a fungal infection on the foot) are at an increased risk for lymphangitis.

Acute lymphangitis

KEY TERMS

Biopsy—The process which removes a sample of diseased or infected tissue for microscopic exam ination to aid in diagnosis.

Lymphatic system—A component of the immune system consisting of vessels and nodes. Waste materials from organs drain into the lymphatic ves sels and are filtered by the lymph nodes.

Septicemia—Disease caused by the presence and growth of bacteria in the bloodstream.

The characteristic symptoms of acute lymphangi tis are the wide, red streaks which travel from the site of infection to the armpit or groin. The affected areas are red, swollen, and painful. Blistering of the affected skin may occur. The bacterial infection causes a fever of 100-104 8F (38-40 8C). In addition, a general ill feeling, muscle aches, headache, chills, and loss of appetite may be felt.

Diagnosis

If lymphangitis is suspected, the person should call his or her doctor immediately or go to an emer gency room. Acute lymphangitis could be diagnosed by the family doctor, infectious disease specialist, or an emergency room doctor. The painful, red streaks just below the skin surface and the high fever are diagnostic of acute lymphangitis. A sample of blood would be taken for culture to determine whether the bacteria have entered the bloodstream. A biopsy (removal of a piece of infected tissue) sample may be taken for culture to identify which type of bacteria is causing the infection. Diagnosis is immediate because it is based primarily on the symp toms. Most insurance policies should cover the expenses for the diagnosis and treatment of acute lymphangitis.

Treatment

Because of the serious nature of this infection, treat ment would begin immediately even before the bacterial culture results were available. The only treatment for acute lymphangitis is to give very large doses of an antibiotic, usually penicillin, through the vein. Grow ing streptococcal bacteria are usually eliminated rapidly and easily by penicillin. The antibiotic clindamycin may be included in the treatment to kill any streptococci which are not growing and are in a resting state.

GALE ENCYCLOPEDIA OF MEDICINE 49

Acute poststreptococcal glomerulonephritis

Alternatively, a ‘‘broad spectrum’’ antibiotic may be used which would kill many different kinds of bacteria.

Prognosis

Complete recovery is expected if antibiotic treat ment is begun at an early stage of the infection. However, if untreated, acute lymphangitis can be a very serious and even deadly disease. Acute lymphan gitis that goes untreated can spread, causing tissue damage. Extensive tissue damage would need to be repaired by plastic surgery. Spread of the infection into the bloodstream could be fatal.

Prevention

Although acute lymphangitis can occur in any one, good hygiene and general health may help to prevent infections.

Resources

PERIODICALS

Dajer, Tony. ‘‘A Lethal Scratch.’’ Discover (February 1998): 34-7.

Belinda Rowland, PhD

Acute pericarditis see Pericarditis

Acute poststreptococcal

glomerulonephritis

Definition

Acute poststreptococcal glomerulonephritis (APSGN) is an inflammation of the kidney tubules (glomeruli) that filter waste products from the blood, following a streptococcal infection such as strep throat. APSGN is also called postinfectious glomerulonephritis.

Description

APSGN develops after certain streptococcal bacteria (group A beta-hemolytic streptococci) have infected the skin or throat. Antigens from the dead streptococci clump together with the antibodies that killed them. These clumps are trapped in the kidney tubules, cause the tubules to become inflamed, and impair that organs’ ability to filter and eliminate body wastes. The onset of APSGN usually occurs

KEY TERMS

Streptococcus—A gram-positive, round or oval bacteria in the genus Streptococcus. Group A strep tococci cause a number of human diseases includ ing strep throat, impetigo, and ASPGN.

one to six weeks (average two weeks) after the strep tococcal infection.

APSGN is a relatively uncommon disease affect ing about one of every 10,000 people, although four or five times that many may actually be affected by it but show no symptoms. APSGN is most prevalent among boys between the ages of 3 and 7, but it can occur at any age.

Causes and symptoms

Frequent sore throats and a history of streptococ cal infection increase the risk of acquiring APSGN. Symptoms of APSGN include:

fluid accumulation and tissue swelling (edema) initially in the face and around the eyes, later in the legs

low urine output (oliguria)

blood in the urine (hematuria)

protein in the urine (proteinuria)

high blood pressure

joint pain or stiffness

Diagnosis

Diagnosis of APSGN is made by taking the patient’s history, assessing his/her symptoms, and performing certain laboratory tests. Urinalysis usually shows blood and protein in the urine. Concentrations of urea and creatinine (two waste products normally filtered out of the blood by the kidneys) in the blood are often high, indicating impaired kidney function. A reliable, inexpensive blood test called the anti-streptolysin-O test can confirm that a patient has or has had a streptococ cal infection. A throat culture may also show the presence of group A beta-hemolytic streptococci.

Treatment

Treatment of ASPGN is designed to relieve the symptoms and prevent complications. Some patients

50 GALE ENCYCLOPEDIA OF MEDICINE