

Health Letter

Updated Medical Information for Your Family

A Better Way to Correct Bone Deformities

Orthopedic surgeons, like general surgeons, are trained to cut out organs and body parts when they are no longer functioning well. With the revolutionary **Ilizarov method**, they are discovering how to take advantage of the body's ability to grow new tissue to correct bone deformities. The surgical application of a circular metal frame called the Ilizarov fixator resolves countless deformities in just a few months without the need to destroy tissue, insert permanent artificial screws or metals, inject compounds, or be immobilized for months in a cast.

Its Origin

Lacking proper equipment in Siberia during 1944-45, a Russian doctor named Ilizarov, made use of bicycle spokes and wires from a nearby factory to treat the fractured and amputated limbs of his patients.

Through coincidence and experimental animal work, he discovered that the best way to promote healing of a broken bone was not to immobilize it by using a cast and avoiding the stress of weight, but that the *biological stress* of walking on or flexing a broken limb causes a trampoline-like effect of pulling and contracting that makes cells grow and heal faster. Instead of operating where a break occurs and inserting screws and metal plates to push broken pieces together, Ilizarov's philosophy was to operate where the bone was not damaged and to pull it apart. For years growth was thought to depend solely on the pituitary gland and that growth stopped when affected by the hormones released during puberty. Ilizarov found that every part of the body

has the intrinsic ability to grow and make new growth plates. In fact, when a bone is broken in a healthy area and pulled apart, the body fills in the gap by growing new bone tissue, in effect, lengthening the bone. As bone grows, two-way messenger molecules known as *integrans* begin to circulate. With the help of growth hormones they encourage embryonic cells to grow

The Ilizarov procedure of limb correction can lengthen and straighten bones so that they can function normally

the necessary new skin, muscles, tendons, arteries, nerves, and even cartilage. The new bone is just as strong as the original bone formed in children.

About the Procedure

The Ilizarov procedure is used today to correct countless problems resulting from congenital deformities (club foot, limb-length discrepancies), traumatic injuries and the loss of limbs and fingers. The procedure sometimes requires open surgery lasting several hours and sometimes can be done with minimally invasive techniques that take twenty minutes depending on the problem.

Whenever lengthening is involved, a *cortiotomy* is done to crack the cortex or outer layer of the bone. Through a one inch incision multiple perforations are made around the bone in order to obtain a clean break along the perforated edge. The bone marrow and its blood vessels are spared in order to nourish the regenerated bone. Several wires are inserted through the bone above and below where the bone is cut and are pulled through the muscles and skin. The wires are attached, under tension at 90° angles to the plane of deformity, to an external circular frame surrounding the limb. This anchors the bone like a trampoline. Since the scaffold allows bones to be lengthened, angulated and rotated all at the same time, limbs can be aligned to correct a deformity and lengthened by pulling the bone apart to induce growth.

The procedure involves two phases, the lengthening phase during which the bone grows and a consolidation phase for new bone tissue to harden and mature. The most that a bone can be made to grow is one millimeter a day. If a limb needs to grow 25 millimeters (one inch), the scaffold must be kept on for

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one month to lengthen the bone, and two additional months to allow time for the new bone to harden.

During the phase the bone is growing or the deformity is being corrected, a patient must adjust the scaffold every six hours, day and night. They are given wrenches and taught how to turn the knobs. They have to be seen every week by the orthopedic specialist who will make further adjustments. Visits are important in the growth phase in order to check progress, take X-rays and adjust the scaffold to the needed correction. During the static phase they can be seen once a month or once every two to three months.

There is some pain the first couple of days after the fixture is put on, particularly if the bone is being lengthened a great deal. A mild pain reliever is usually sufficient to control the pain and within a week patients usually get used to the pressure and feel less discomfort.

Each bone can be lengthened 20% of its length at one time. Minor deformities on a limb can be corrected with one procedure, but major deformities that involve three different bones on the same limb (such as the foot, the leg and thigh bone) may require up to three different procedures. Usually only one limb is done at a time. It used to be that parents of children with limb deformities were told to wait until the child was fully grown before undergoing surgery, now with the Ilizarov method it is possible to stage treatment several years apart. For example, a child whose leg is not growing properly can be operated before the age of four, a second operation can be performed between the ages of 10 and 12, and the final operation can be done at 16 or 17. In this way, three or four inches can be gained during each operation and any deformities that occur during development can be corrected at the same time. Staging the procedure allows the joints of growing children to be kept in mechanical alignment at all times to prevent excessive wear in one area. It is extremely impor-

tant to preserve the joint in mechanical alignment because if a joint deformity develops it is difficult to correct.

While it is possible to attempt procedures on children that ordinarily would not be attempted on an 80 year-old person, even older people who are otherwise healthy and can walk, can take advantage of this procedure.

Who Is a Candidate?

The Ilizarov procedure generally is not justified as a cosmetic solution for someone who would like to be taller or who is tired of buying two different pairs of shoes because one foot is larger than the other. Similarly, the Ilizarov procedure is not a treatment for simple broken bones which heal well with a cast. It should only be used in cases of complicated fractures where there is loss of bone, angulation or rotational deformities, or when the bone fails to heal. The procedure is best suited to the following problems:

■ **Bones that heal badly or not at all.**

The procedure is commonly used on people who, due to an injury, have had fractured arms or legs that have healed crooked or shorter than the other arm or leg. The resulting bad alignment of the bones often leads to pain or osteoarthritis (a degenerative wearing down of bone and cartilage). When the joint and bones are aligned properly the pain or the osteoarthritis goes away. The procedure can also be used on people whose bone injury has become infected or failed to heal.

■ **People with osteoarthritis due to bad alignment.** People born with common problems such as knocked knees or bowed legs have bad alignment. All tend to develop osteoarthritis of the ankle, knees or hip as the cartilage around the joints wears out sooner than it should. Although cartilage regenerates throughout a person's life, in individuals with bad alignment, the cartilage is not replaced as fast as it wears out and the person develops painful osteoarthritis. In fact, 90-95% of people with osteoarthritis of the knee, as well as a

certain percentage of osteoarthritis of the hip and ankle are due to bad alignment, not to disease of the cartilage.

Usually these people resort to nonsteroidal antiinflammatory medications, and then to arthroscopic surgery which cuts away the damaged tissue. However, such measures only treat the symptoms not the cause, and the pain returns. Eventually, when the cartilage wears out the only solution is joint replacement surgery. But 55 is too young an age to get an artificial knee because artificial joints don't last very long, and have to be replaced 10 or 15 years later.

The solution for these individuals really is realignment. Once the bone of a crooked limb is lengthened and realigned, new cartilage grows and the osteoarthritis pain disappears. Most people with these problems, however, are hesitant to submit to surgery because they get by with medications and arthroscopy. Only when faced with a joint replacement will they consider it, but by then if the cartilage is worn away it may be too late to resort to an Ilizarov procedure.

■ **Congenital deformities.** • People born without an arm or leg as was the case of children of women who took thalidomide early during their pregnancy to control nausea • people born with very short limbs such as dwarfs or with one leg shorter than the other • people with deformities such as club foot or with several deformities on the same limb.

Before this procedure was available, standard medical practice was to shorten a good leg or amputate a badly deformed leg. Fortunately, this is no longer done. Shortening a good leg only causes the destruction of normal physiology. It weakens the muscles and tendons that support the limb and can lead to serious complications such as infection or wounds that don't heal well. Even with the new computerized hydraulic knees and ankles, amputations are not always the best solution. Not only are the prostheses very expensive but they have to be changed every two to three years,

especially in growing children. Because the skin on a remaining stump is not like that of the feet, they develop blisters which cause a great deal of discomfort. Moreover, every time a person has to get up, they have to rely on crutches or an artificial leg.

The Ilizarov procedure offers many people with major deformities that would otherwise have to be amputated, the possibility of having a useful leg that will support them and allow them to walk and carry on a more normal life. With the ability to make some limbs grow, it is a shame to subject people to an artificial leg when they can have a leg or an arm of their own with which to function.

When traumatic amputations are necessary, the Ilizarov method can be used to grow the stump whether on an arm, leg or hand sufficient to allow a prosthesis to be fitted.

■ **Limbs lost to tumors or accidents.** The procedure can also be applied to people who have tumors or infections in the bone such as chronic osteomyelitis which requires that a full section of the leg be cut. In such cases, the affected area is cut and the bone is grown above and below the cut area.

Precautions

The procedure's biggest complication is really the tolerance the individual has. Some people who have claustrophobia may not tolerate the application of a mechanical device around their body. Others will not comply with treatment and may even become depressed. The procedure works well on cooperative patients who are highly motivated and will exercise the leg or arm by walking or carrying on with their normal activities, and who adjust the device as instructed. While a rehabilitation program is important for healing to take place, what is really encouraged is normal, everyday functional use of the limb. Every time a person moves a leg or an arm to walk or to comb their hair they are contracting the muscles and relaxing them and that is what is needed for the bone

to grow.

To avoid infection, the procedure must be done on normal healthy tissue. A bone cannot be operated on to place the Ilizarov frame where it is broken because it will not heal. It must be done above or below the break. It is important to know where to insert the wires so as not to damage nerves, arteries and muscles. As the muscles move over the pins there can be drainage, redness, inflammation or an infection. Antibiotics are given should these problems occur.

Not all the equipment produced today is top grade and caution is warranted. The Ilizarov fixture is really the gold standard.

The procedure began to be performed by a few surgeons about ten years ago, but not all surgeons are fully trained in the procedure. Many of the companies that make the Ilizarov scaffolds offer weekend seminars showing how to use the equipment, but that is not sufficient training. The procedure has a high learning curve to gain experience. Since cases vary and the surgeon must make many judgement calls along the way, success is not just a matter of good equipment, it depends on a full understanding of the concepts behind how, when and why to use this method.

Hybrid procedures that combine Ilizarov's method with traditional methods are sometimes being done which often result in high failure rates. In experienced hands, the procedure should not have more than two to three percent failure rate.

A doctor who has qualified to be a member of ASAMI (Association for the Study and Application of Methods of Ilizarov) is qualified to perform such surgery. Of course, not all qualified surgeons belong to this or other similar national organizations, therefore, before undergoing an Ilizarov procedure it is important to inquire where the physician was trained and the extent of the training.

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Vitiligo: The Loss of Skin Color

Vitiligo affects people of all races and ages causing white, uneven patches to appear on the skin. The severity of the disease differs from person to person. Some will lose pigment in small patches, others will lose it in whole areas of the body. The darker the skin, the more noticeable the problem, and the more mentally devastating it can become for a person, particularly if it occurs in an exposed area. Vitiligo generally is a lifelong problem, but it is not contagious, nor is it a threat to health. The disease is often sporadic, developing in cycles of pigment loss and stability, where progression may stop for months or years. No one knows why this occurs.

People develop vitiligo when the pigment producing cells (melanocytes) of the skin are destroyed or fail to produce the melanin that gives skin its color. While no one has been able to pinpoint the cause of this destruction, theories abound.

Vitiligo has been said to be linked to thyroid problems, diabetes and other endocrine abnormalities, but recent studies have shown no correlation. There is also no link to a genetic defect that makes the melanocytes susceptible, nor to nutritional deficiencies.

Most researchers seem to agree that the destruction of the pigment-producing cells is caused by an autoimmune disease. However, no one has as yet identified the autoimmune abnormality that causes the immune system to destroy those cells, and the theory doesn't apply in all cases. The fact that vitiligo sometimes runs in families, buttresses this immune system theory. However, since it is almost always symmetrical — if pigment is lost in one hand, chances are that it will be lost in the same place on the other hand — it is thought less likely to be a random event like an immune abnormality.

Treatment

Since it has been impossible to pinpoint

a definitive cause, a cure for vitiligo still remains elusive, but medical treatment sometimes can help. There are several approaches to treatment:

Cosmetic Preparations: People with very small patches of vitiligo may simply cover them up with a good cosmetic preparation. These products (*Cover Mark, Derma Blend*) come in various shades which can be blended to obtain the right skin shade. They are thick, adherent, and will last the whole day.

Topical Corticosteroids: In some instances of very early vitiligo topical corticosteroids have been reported to cause repigmentation. Since such results are unusual, this option is rarely used. Treatment can thin the skin.

Repigmentation Therapy: People whose vitiligo covers less than 50-75% of surface area may want to consider repigmentation therapy. This treatment involves exposure to ultraviolet light after oral or topical psoralens medication.

While Psoralens and Ultra Violet light A rays (PUVA) stimulate pigment cells from the surrounding skin and pigment cells within hair follicles to start making pigment, there is no guarantee that the treatment will work. At best, it works in about 50% of people. The longer a person has had vitiligo, the less likely treatment will be effective. Even when it does work, the vitiligo may recur or new patches may develop elsewhere. Retreatment may be necessary.

Generally, treatment is done two or three times a week. If after some 20 treatments there is evidence of repigmentation, then therapy can continue for an additional 10 to 30 treatments. At first, treatment may make the vitiligo look worse since it also pigments the normal skin.

Natural sunlight must be avoided as much as possible while undergoing psoralens treatment, because severe sunburns can occur, particularly in tropical climates. Topical psoralens remains on the skin for weeks and the oral medication remains in the body for 24-48 hours.

Only controlled exposure to ultraviolet light lamps is necessary to activate the melanin.

The biggest risk of PUVA therapy in patients with vitiligo is skin cancer. While the risk of skin cancer is usually 1-2% in tropical climates among the general population, PUVA treatment would double the incidence. The risk of cataracts may increase, so the eyes must be protected while undergoing treatment.

Depigmentation Therapy: This type of therapy is aimed at destroying the remaining pigment in those whose pigment is almost all gone. A chemical *Berobquin* (a monobenzylether of hydroquinone) is available as a topical cream capable of permanently destroying the remaining melanocytes. It is applied twice daily to areas that still have pigment. It takes a few months for all the melanocytes to disappear and even out the skin color. It is a treatment of last resort for people that have more than 75% loss of pigment. Such therapy makes people susceptible to sunburns and skin cancer.

Final Thoughts

Treatment for vitiligo is most valuable for the individual whose vitiligo is in an area of the body that is disfiguring. It is also for the well motivated patient with a recent onset of vitiligo.

There are many alternative options that people with vitiligo are tempted to try. Most of these treatments are inoffensive. However, it is important to do so in a scientific manner. If it is a new cream, it is best to try it on one area rather than all over the body. Those whose vitiligo is symmetrical need to try it on one side so as to have a comparison with the other unmedicated side. It is very easy to fool oneself into thinking that something is working, unless it is compared so that there is some certainty that it is in fact working.

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Grafting Color Back...

Besides traditional medical treatment, some vitiligo patients can repigment their skin with skin grafting procedures. Although in the United States insurance companies do not cover vitiligo treatment, several surgical techniques are available for repigmenting localized vitiligo that has been recalcitrant to medical treatment.

One of the techniques available, the **autologous minigrafting technique**, is a procedure that involves taking several small “punches” of a person’s skin and transplanting them to their affected vitiligo areas. The repigmenting effect of autologous minigrafting is based on the “pigment spread” phenomenon of the small grafted pieces of normal skin. The mechanism of “pigment spread” is most probably due to migration and multiplication of melanocytes, with resultant diffusion of melanin.

The treatment can only be done on patients whose vitiligo has been stable for at least one year. To further ensure success, a small test of four punch grafts must be done before beginning the actual treatment. After the four grafts are transplanted to the vitiligo area, three or four months of observation are necessary to determine if the treatment will be successful. If the grafts take, then the entire vitiligo area can be grafted.

The procedure works best on localized, small areas of stable vitiligo patches and can be done on an outpatient basis with local anesthetic. Depending on the size of the area to be covered, several visits may be necessary. However, it is possible to perform as many as 100 to 150 punch grafts on each visit.

Minigrafts are harvested from the donor site at a distance of 1 to 1.5 mm from each other. A 2 x 2 cm area yields approximately 100 minigrafts, enough to cover an area of vitiligo of about 7 x 7 cm. The minigrafts on the recipi-

ent site are placed 5 mm apart from each other. Such a procedure would take approximately one hour. Recovery is not painful and the surgical sites heal within two weeks.

In order for the new pigment to grow smooth and even, the size of the graft punch must be kept small. A graft that is 1.25 mm in size, is sufficient to repigment an area of 5 mm. Larger size grafts do not produce good results; the round edges of the grafts will be more noticeable. The thickness of the graft should be approximately 1 to 2 mm, in order to prevent a cobblestone appearance. Expertise on the part of the physician, therefore, is an important consideration. The results are not immediate. While it takes about three months for the melanocytes to produce more melanin and migrate into the abnormal skin, it will take up to a year for the color of the grafted skin to blend and match with the normally pigmented surrounding skin. If the repigmentation of the vitiligo area is slow, sometimes the melanocytes can be stimulated with ultraviolet light treatment.

The success rate of the procedure is high and total repigmentation of the area can be obtained if established recommendations are followed. Although it is a time-consuming procedure, when the vitiligo area is repigmented, the new skin color will remain permanently unchanged.

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...and Other Options

Although a cure for vitiligo is not yet within reach, two alternative treatments still under development promise great expectations for people with localized vitiligo which has remained stable for a year or more.

Autologous Melanocyte Culture. This procedure involves taking a one to two inch piece of normal skin containing

melanocytes from the individual, separating the melanocytes from the skin with different enzyme substances, and culturing the melanocytes in a special melanocyte growing medium in an incubator. Everything must be done under very sterile conditions to avoid bacterial contamination. Once enough melanocytes have been cultured, the vitiligo area on a person’s skin has to be scraped. The solution with the suspension of melanocyte cells is then poured over the abraded vitiligo skin area and covered with special dressings. Usually within 24-48 hours, the melanocytes have attached themselves and repigmentation can be seen a few weeks to some months later. Sometimes the donor area and the vitiligo area are treated with PUVA therapy prior to the procedure to stimulate the melanocytes. This treatment works best on exposed, localized areas of the face or hands.

The risks are low but can include some scarring or infection. The new skin usually looks a little darker than the person’s normal skin color, but will look better than it did with the vitiligo. Some researchers are wary about procedures that use melanocytes in cultured medium for fear that the process can cause them to develop into melanoma. There are no reports stating any such problems with treated areas where this procedure has been used. Positive results have been reported.

Although the autologous melanocyte culture can have a success rate of more than 50%, at present it is not a treatment of choice because culturing melanocytes is a difficult and time-consuming process.

Melanocyte Transplant or Epidermal Graft. This other treatment modality uses negative pressure on an area of normal skin that does not have vitiligo, to create a suction blister that separates the epidermis from the dermis. Since the epidermis (the top layer of the blister) contains melanocytes and keratinocytes, this thin layer is then

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transplanted to the vitiligo area which has previously been scraped to create an oozing wound. The area is then covered with a dressing for 48 to 72 hours, during which time movement is limited to prevent the new skin from detaching itself. The outpatient procedure is done with local anesthesia and analgesics can be taken as needed to alleviate any post operative pain.

The procedure has many advantages. Several one inch round suction blisters can be used to cover extensive vitiligo areas. The blisters leave no scars, repigmentation occurs within a few weeks and, in experienced hands, it can be 60% successful (better results are obtained on the face and the trunk than on bony areas such as the hands and feet). The risks are low, but do include the possibility of infection and pain. However, while it is possible to create and transfer the blister without the need to do any culturing, at present the process of creating the blister is too time

consuming. A new machine is now under development that will shorten the blister formation into a 20-minute procedure.

A Treatment To Avoid

Melagenin treatment for vitiligo was proposed over a decade ago by a Cuban pharmacologist, Dr. Miyares Cao. It caused quite a commotion at the time because the treatment was sold as the long-awaited cure for vitiligo.

No one knows the exact process he followed for the preparation of the lotion, but Dr. Cao used human placenta extract, which is supposed to contain a melanocyte stimulating substance. He proposed that the lotion be applied to the vitiligo area three times a week and to expose the area to infrared light. Dr. Miyares claimed a repigmentation success rate of 80% in his patients, but such results ultimately proved false.

Double blind studies carried out at the Central University of Caracas at the

urging of the Ministry of Health, for example, showed no such results. This, despite the fact that patients were treated with melagenin lotion provided directly by the Cuban institute that was doing the treatment at the time. After a six month treatment, which followed all recommendations, there was no significant difference between the placebo control group and the melagenin therapy group. Studies done in other countries also showed that melagenin therapy did not work. Despite the evidence, some people continue to try this treatment.

Melagenin therapy is not without its risks. Since it comes from human placenta, precautions need to be taken to check for hepatitis B and C as well as for HIV. Otherwise, the person receiving treatment could become infected through any break on the skin if the product is contaminated.

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Its Getting Easier to Exercise

To become physically fit the average, healthy person does not need to become a marathon runner or spend hours in a gym. A moderate amount of exercise can produce significant fitness benefits.

In 1978, the American College of Sports Medicine guidelines recommended 20 to 60 consecutive minutes of **aerobic activity** three to five days per week to improve cardiovascular conditioning. Heart rate should be maintained at 60 to 90 % of maximum. One common way to determine maximum heart rate is to subtract age from 220. Aerobic exercises make use of large muscle groups through continuous, rhythmical activities such as walking, jogging, swimming, cycling, dancing or stair climbing. It increases cardiorespiratory fitness (the body's efficiency in using

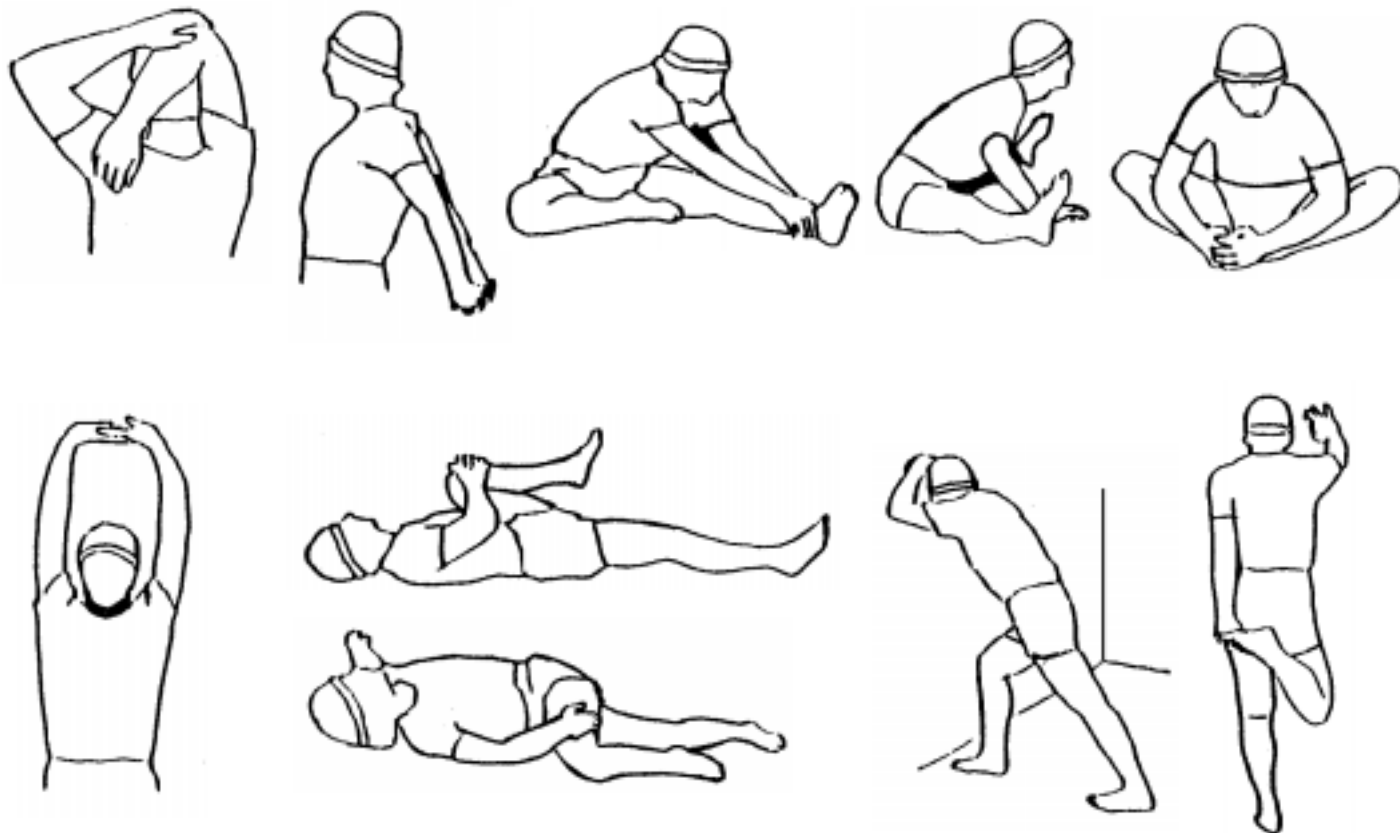
oxygen), aids in weight control, lowers blood pressure, improves the body's ability to metabolize glucose, and result in higher levels "good" HDL cholesterol in the blood, believed to be important in preventing heart disease. However, people who only do aerobic activity will lose muscle mass as they get older.

In 1990, **strength training** exercises were added as part of an overall fitness program to prevent loss of bone and muscle. Strength training guidelines call for at least two days a week of resistance exercises that condition the body's major muscle groups. These exercises should be done as single sets of eight to 12 repetitions, at a moderate speed, with a full range of motion and normal breathing. As people live longer it is important to maintain bone and muscle strength to help avoid injury and pre-

vent problems such as back pain and osteoporosis. Strength training is an ideal way to accomplish this.

Recently, modifications to aerobic and weight training exercises have been made, based on current research that will help the average person adhere to a fitness program.

It has been shown that breaking up aerobic exercise into three 10-minute sessions throughout the day can be just as effective as one 30-minute session. In addition, performing one set of weight lifting exercises (eight to 12 repetitions, each hitting the major muscle groups in the upper and lower body) two to three times a week will build the same muscle endurance and strength as doing multiple sets in one session. Such a session of strength training can be done in 20 minutes. Intensity of training and dura-



tion of training are interrelated. Low intensity activities, such as walking, performed for long duration can produce similar fitness improvements as high intensity activities, such as running, for shorter duration, if the total energy expenditure is equal.

Exercise is not just for young adults. Studies show that people of all ages can im-

prove their levels of fitness if they stop leading sedentary lives. Even people in their 70s and 80s can improve their fitness levels with a regular routine of low impact exercise such as walking or swimming.

Now, the new national exercise guidelines also recommend increasing **muscle and tendon flexibility** to maintain range of motion and function

throughout life. This means doing static stretches, such as those shown below, and holding the position 10 to 30 seconds to the point of mild discomfort. Each stretch should be repeated four times per muscle group, and done two to three days per week. They are also a great way to relax all the muscles.

UNIVERSITY OF FLORIDA



On the Frontier

■ **Technology May Soon Help Accurately Determine When to Operate on Abdominal Aortic Aneurysms.** Researchers at the University of Pittsburgh Medical Center are using CT scans and state-of-the-art computer modeling to construct “virtual aneurysms” which may aid surgeons in determining when to operate on an abdominal aortic aneurysm

before it ruptures. An abdominal aortic aneurysm is a bulging of the aorta, the main artery that carries blood to organs and the lower extremities. Left untreated, the aneurysm continues to expand until it ruptures unexpectedly and bleeds, causing death in up to 80% of patients. The standard surgical procedure to repair an abdominal aortic aneurysm involves a large abdominal incision. The aneurysm is repaired by

suturing a Teflon/polyester graft inside that aneurysm. Recently, vascular surgeons at UPMC have used a minimally invasive procedure called endovascular surgery to repair the aorta from the inside. A catheter containing a collapsed polyester tube is inserted into the person’s femoral artery and moved to the site of the aneurysm. Once inside the aneurysm, a spring-type attachment system hooks the tube to the inside walls

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of the artery on either end of the aneurysm and is anchored into place. Blood then flows through the implant, effectively depressurizing the aneurysm.

Endovascular surgery is still a new, exploratory field and only a small percentage of people are eligible for this technique. Therefore, the only option for most patients is to undergo traditional surgical repair. Generally, surgeons repair an abdominal aortic aneurysm when it exceeds 5 cm (2 ½ inches) in diameter but this does not take into account the aneurysms characteristics such as its shape or wall thickness which could have an effect on their growth and potential to rupture. The problem is difficult because these aneurysms mainly afflict people over 60 years of age, for whom surgery itself is a risk. Now researchers are developing a technique to noninvasively assess the wall stresses acting on individual aneurysm based on the person's blood pressure and a three-dimensional reconstruction of CT scans taken prior to surgery. The scans provide cross-sectional images of the abdominal aortic aneurysm which are then processed and refined by computer analyses into a virtual aneurysm. By using these models to estimate the stresses within the aneurysm wall, it may

be possible to better assess a specific aneurysm's propensity to rupture and to make better decisions regarding when surgical intervention is warranted.

■ Lack of intestinal bacterium linked to kidney stones in cystic fibrosis patients.

Cystic fibrosis patients who lack the beneficial intestinal bacterium, known as *Oxalobacter formigenes*, have an increased chance of developing a condition that can lead to kidney stones, and extensive use of antibiotics may be to blame.

Cystic fibrosis, a common genetic disease that afflicts Caucasians, slowly destroys the lungs through recurrent infections and affects other vital organs. Kidney stones are a frequent complication as the life expectancy of these patients increases.

O formigenes appears to break down oxalate, also called oxalic acid, before it binds with calcium to form crystals that turn into kidney stones. Oxalate is an abundant chemical that forms as a by-product of digestion. It also is found in high concentrations in many foods, including asparagus, tea, broccoli, peanut butter, spinach and chocolate. Excess amounts of this naturally occurring organic compound have been linked to certain heart problems, kidney failure

and even death. When oxalate levels are kept low, it is easier for the body to excrete the substance through the kidneys. But if there is more oxalate than can be dissolved in the urine, the crystals settle out and form stones.

Most children naturally acquire the bacterium from their environment between the ages of 9 months and 1 year. Why some people lack the intestinal bacteria is not known, but overuse of antibiotics may prevent natural colonization with the organism, or may irreversibly destroy the colonies. Children who are placed on antibiotics for very minor things may lose their normal flora, possibly placing them at higher risk of complications later. Similar data is being found with patients who are suffering from kidney stone formation as a primary disease. Kidney stones afflict 5 to 10% of the world's population.

It is thought that the bacteria rarely regrows because people develop a natural resistance to the organism after it disappears from the body. Researchers are investigating an enzyme treatment in pill form, given before and after meals, that may help reduce oxalate levels, thus help prevent kidney stones.

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