Hughston Health Alert

6262 Hamilton Road Columbus, Georgia 31995

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Pitching

Injuries without Contact

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This spring many athletes will be injured playing baseball. Many of the injuries will result from the "simple" act of pitching, or throwing, the ball. Pitching involves the development of a force that begins in the legs and is ultimately transmitted through the body to the tips of the fingers; the result: a ball flying through the air at speeds approaching 90 mph. The poorly conditioned or overworked athlete often falls victim to these tremendous forces. The natural, smooth transmission from foot to hand is interrupted. Forces concentrate instead on muscles, tendons, ligaments, or joint structures. The outcome can range from a missed game to a lost career.

Complaints: a clue to the problem

The act of pitching is divided into phases: *wind-up; cocking; acceleration* as the arm whips around on momentum begun by the legs and body, culminating in *release* of the ball at the point of maximum speed; *deceleration* as the arm slows from this tremendous speed to a complete stop in fractions of a second; and *follow-through*.

Knowledge of which pitching phases bring on discomfort can point to shoulder or arm structures that may be damaged. For example, pain during cocking or acceleration usually indicates that a structure in the front of the shoulder is injured.

Knowing when and where the pain occurs often pinpoints an injury, of course, but there are exceptions. Numbness in the small finger may result if poor throwing mechanics cause irritation to a nerve that runs across the back of the elbow. Loss of pitching speed or velocity associated with constant dull aching shoulder pain may mean a partial tear in the rotator cuff, a tendinous structure that controls some shoulder motions. The feeling of a "dead arm" may signify slippage or instability in the shoulder joint. Inability to fully straighten the arm or pain during ball release or deceleration usually indicate damage to the elbow joint surfaces. A pitcher's ability to recall these details of where and when pain occurs is often invaluable to the physician.

When injuries occur

The two greatest offenders in throwing injuries are poor conditioning and overuse. In either case, the ability to control the arm is lost and the athlete throws with poor mechanics. Forces are not smoothly transmitted, so movements become disjointed and jerky. The naive pitcher who comes out throwing 100% in the first days of practice, before getting his arm back into shape, may be out for the season before the first game. Likewise, the player who tries to impress his coaches and teammates by pitching beyond the point of fatigue will likely fail himself as well as his team. Fortunately, coaches have learned to bring pitchers up gradually as the season begins and pull them out of the game at the first sign of fatigue.

When injuries do occur, the physician interviews the pitcher and examines the shoulder and arm for areas of tenderness, loss of motion, and signs of laxity in the joints. The physician may actually watch the pitcher throw.

Tests may be needed for full evaluation. Routine x-ray films can reveal abnormalities of bony structures. To fully visualize joint structures, an arthrogram, where x-rays are taken after a contrast medium, or dye, is injected into the joint, may be needed. Bone scans, which involve the use of radioisotopes, may indicate cracks that don't appear on x-ray. An electromyograph (EMG) tests nerve function. Computerized machines such as the Cybex or Kin-Com can evaluate the strength of selected muscle groups. These machines are particularly useful in monitoring progress after treatment has begun.

Getting back to the mound

Fortunately, most pitchers seek medical attention as soon as their game begins to fail, before structural damage occurs. Overuse strains, tendinitis, and sprains are usually treated effectively without surgery. A period of rest is the first step. Modality treatments, such as ice, heat, or ultrasound, may be useful but should be given **only upon recommendation of physicians and trainers**. Medications, such as aspirin, Motrin, or steroids, may be used to decrease inflammation and pain during the recovery period. (These steroid drugs are *corticosteroids*, a safer and entirely different class of drugs from the anabolic steroids recently associated with widespread controversy.)

After an appropriate period of rest and subsidence of pain, a therapeutic exercise program is begun, aimed at restoring full flexibility and strength to the arm and shoulder. Only then can throwing resume.

In cases of structural damage, surgery is usually needed to restore full function. Though many conventional procedures are still used, arthroscopy has revolutionized treatment of throwing athletes. The arthroscope allows surgery to be performed through small puncture holes instead of long incisions. Minimizing scar tissue often means a more rapid return to play.

When throwing resumes

Restraint is the key. Strengthening, stretching, and modalities are carefully blended with a gradually progressive throwing program **coordinated by physicians, coaches, and trainers**. The elements of speed and distance are advanced only as the pitcher can control his arm with proper mechanics. The ultimate goal in all cases should be not only a return to play but also a correction of the poor habits and mechanics that caused the injury.

Mike Axe, M.D.
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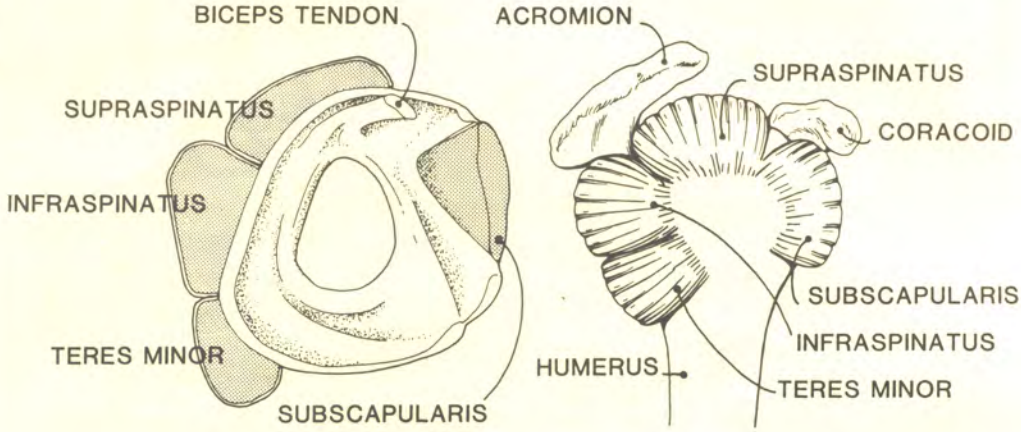

TRAINING FOR A BETTER LIFESTYLE

Rotator Cuff Exercises

Many of us have heard of someone with a rotator cuff tear, or as the old baseball greats would say, "rotary cuff tears." Most of us have friends or family members who have developed tendinitis in their shoulders, especially when trying overhand activities such as swimming or playing tennis. There *is* help for those painful shoulders, and in many cases it *may* even be as simple as doing a few exercises at home.

What is the rotator cuff?

The rotator cuff is composed of four muscles (see figure): subscapularis, supraspinatus, infraspinatus, and teres minor. (When we speak of irritations to the rotator cuff, we are generally referring to the supraspinatus and infraspinatus muscles and tendons.) The rotator cuff attaches to the humerus (the upper arm bone) and helps lift the arm overhead; it rotates the arm outward, or pulls the hand up behind the head. It also stabilizes the humeral head, or ball, in the shoulder socket and keeps it in the proper position for good use of the arm. Unfortunately, because of its exposed position, it can easily be injured.

In overhand activities, such as throwing or hitting a tennis serve, the rotator cuff slows the arm down after ball release or racquet contact. This deceleration activity can wear down the rotator cuff and eventually injure it if too much throwing is done or if mechanics are poor. The rotator cuff can also be damaged by "butting" against the roof of the shoulder

socket during activities such as swimming.

Rehabilitation

Many rotator cuff injuries can be effectively rehabilitated by a correct exercise program, but **rehabilitation should always be initiated under the supervision of a physician and a therapist**. Stay away from heavy weights or exercises that irritate the shoulder. Lower weights and higher repetitions, used in the proper manner, seem to work best. Some exercises from a typical program are illustrated below. Your trainer, physical therapist, or physician may prescribe any or all of these exercises, depending on your particular problems. Remember that it generally takes *at least* 6 weeks to gain good strength and flexibility. **If you are returning to an athletic activity, you must return *gradually,* according to guidelines outlined for you by your health care specialist.**

Tab Blackburn, M.Ed., P.T., A.T.C.
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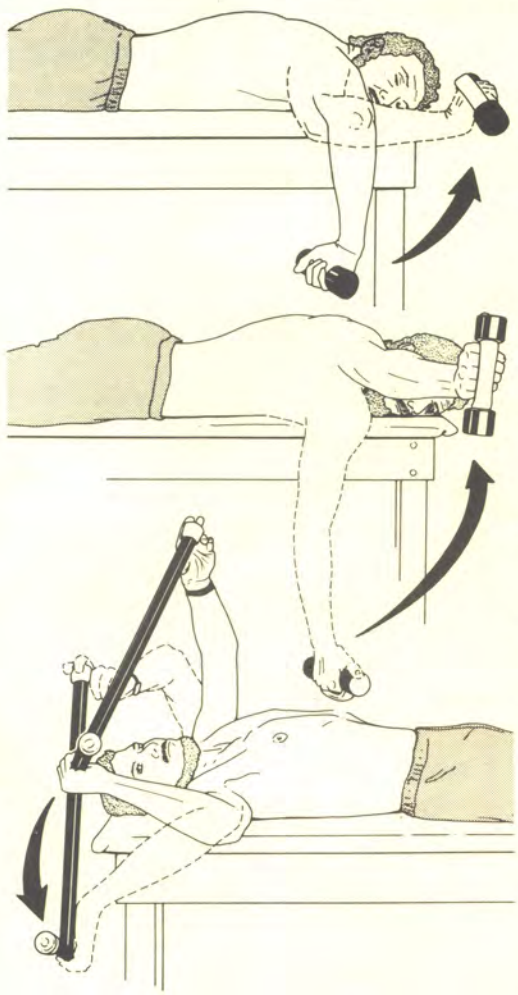


Breakaway Bases

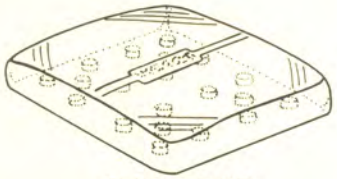
Sliding into second. Safe? Wrong! The simple act of sliding to contact a base can result in serious ligament tears, dislocated joints, and even broken bones. Who is at risk? More than 30 million people who engage in baseball or softball each year.

As the leading leg in a foot-first slide contacts a stationary base, the tremendous deceleration forces, if not properly dissipated, can focus in a concentrated area, resulting in injury. The fixed base appears to be a major contributor to these injuries. Research, however, is seeking to remove this risk from the sport.

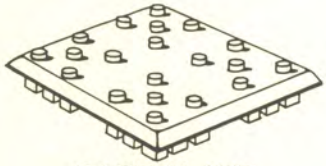
A recently reported study at the University of Michigan has shown that the majority of serious softball sliding injuries can be prevented by the use of quick-release, or breakaway, bases. These new bases consist of two components that fit together. The bottom portion is a rubber mat that is flush with the ground (similar to home plate). The upper surface of this mat has small, blunt rubber projections that fit into holes on the undersurface of the top portion, which is the same size as the stationary bases now in common use. The rubber mat plugs into an anchor system set below ground level. If a player slides into a breakaway base with excessive force, the top portion simply dislodges.

Researchers at Michigan monitored and evaluated sliding injuries during 1,260 intramural softball games in 1986 and 1987. Half of the games were played with traditional bases, the other half with breakaway bases. There were 45 sliding injuries with the standard bases, compared to only 2 with the breakaway bases. It should be noted that only one brand of breakaway base was evaluated in this study, the Rogers Break Away Base. Other brands need similar testing to evaluate their safety and effectiveness.

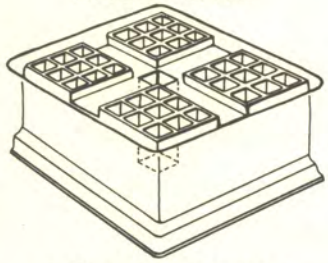
The breakaway portion of the Rogers base has been designed in four different models: youth, teen, adult, and pro. These models vary in hardness and the amount of force required to dislodge them, the youth model being the softest and requiring the least amount of force to dislodge. The adult model is the only one that has been tested thus far. Research is still ongoing on the reliability of the other models.



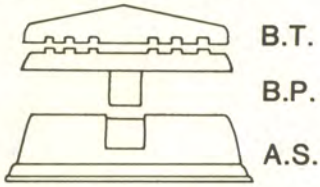
BASE TOP



BASE PLATE



ANCHOR SYSTEM



Cross section

Breakaway bases may be a major breakthrough in the prevention of softball injuries. Their greatest advantage is the prevention of injuries that may cause permanent disability or lead to degenerative arthritis. A set of three breakaway bases like those tested at Michigan costs about $395, compared to $150 for a set of stationary bases, but the increase in price seems justified if the expense of injuries is considered. Medical costs for the 45 sliding injuries with standard bases in the Michigan survey were $55,050, compared to $700 for the 2 injuries with breakaway bases. Projections by the Centers for Disease Control (CDC) in Atlanta estimate that using only breakaway bases in softball leagues would prevent about 1.7 million sliding injuries and save $1.9 billion in medical costs each year.

These new bases have been used in amateur softball association national and world championships. Umpires have reported no problems in making calls. In the Michigan study, the bases did not detach during normal base running. They did break away with

slides up to six times per game, but were easily and quickly replaced without significant delay. Currently, two of the major U.S. softball governing bodies have approved the use of breakaway bases.

While many factors, such as poor sliding techniques, poor conditioning, and alcohol consumption before and/or during play, may also contribute to sliding injuries, the conversion to breakaway bases holds the promise of dramatically decreasing injury rates in this sport.

Dan Joyce, M.D.
Columbus, Georgia

THE AGELESS ATHLETE

Walking for Aerobic Exercise

Fun or fitness? What's the bottom line?

Increasing numbers of persons are engaging in fitness activities such as walking, jogging, swimming, bike riding, etc. We have become familiar with the idea that the best exercise is *aerobic* exercise, or activity that requires the body to improve its capacity for handling oxygen. Aerobic exercise results in beneficial changes in the lungs and cardiovascular system.

Basic guidelines

The several factors to consider before selecting a cardiovascular or cardiorespiratory fitness activity all revolve around the quality and quantity of exercise. Probably most important is to **never embark on such an exercise program without the advice or monitoring of your personal physician**.

The American College of Sports Medicine makes the following recommendations for individuals wishing to engage in a cardiovascular fitness program. While a program such as this is the goal, each individual should build up to this level at his or her own comfortable pace.

1. ***Frequency:***
   3 to 5 days per week
2. ***Intensity:***
   60% to 90% of maximum heart rate
   (max HR = 220 - age)
3. ***Duration:***
   15 to 60 minutes
4. ***Mode of activity:***
   Any activity that uses large muscle groups, that can be maintained continuously, and is rhythmic in nature.

Obviously, duration depends on intensity of activity; a person working at 90% maximum heart rate will probably tire quicker than a person working at 60%. We recommend that the non-athletic exercising adult work at lower intensities for longer durations; for example, 70% to 75% intensity for 45 minutes. We believe that there are fewer hazards and higher compliance associated with lower intensity training.

Walking aerobically

Walking has emerged as a popular form of aerobic exercise because it is convenient, it requires no special equipment except a good pair of shoes, and it is probably the safest activity for the older individual, the cardiovascularly impaired, and those individuals predisposed to orthopaedic injury.

Using "heavy hands" has recently become popular in conjunction with aerobic walking. Research by the Committed Fitness staff indicates that heavy hands may not be as helpful as claimed, however. While there is a greater amount of work performed using "vigorous" arm swing, using hand weights does not appear to change energy cost as much as proponents claim. The true effectiveness of using hand weights, ankle weights, and hip weights while performing aerobic activities is still under study. More research is needed to evaluate different combinations of weight carried and to examine any gait abnormalities due to the excess load. Our current opinion is that research is not conclusive enough to recommend hand weight use as a necessary part of the aerobic training process. We further recommend that individuals with a history of heart disease abstain from hand weight use.

Stride length when walking is another consideration. Walk in a manner that is within your normal stride, in which the horizon stays level. Refrain from an excessive stride length; instead, vary your stride

Figure 1

Standing back extension: Stand with your hands in the small of your back and your feet apart. Gently lean backward, keeping your knees straight. Hold this position briefly. Return to an upright position. Repeat 15 times.

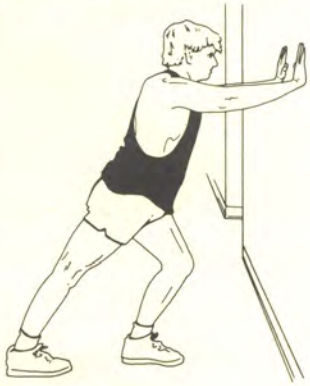


Figure 2

Heelcord stretching: Lean into a wall with your weight on your heel, your knee straight, and your foot slightly pigeon-toed. Lean in far enough to feel the stretch in the back of your calf. Hold for 10 counts. Relax. Repeat 15 times.

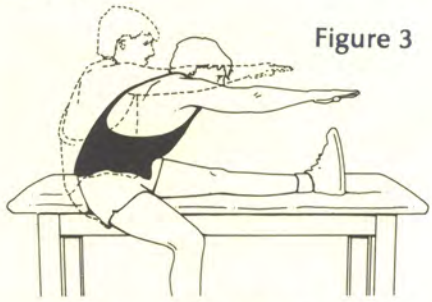


Figure 3

Hamstring stretching: Sit along the edge of a bench with one leg stretched out in front of you and the other dangling over the edge. Lean forward with your chin aimed toward your toes. Your knee should be straight from your hip. (No bouncing!) Stretch for 3 - 5 minutes.

frequency, or pace (the number of steps you take per minute).

A good flexibility program should be included in any walking program and should consist of standing back extensions and some form of heelcord and hamstring stretching. (Figs. 1-3).

The bottom line

Is walking a good cardiorespiratory fitness activity? The answer is ***yes, if*** it is performed according to appropriate guidelines. A casual stroll is probably not sufficient exercise for an average individual. Walking is definitely a great activity for initiating a fitness program. Many walkers may, as time progresses, advance to more strenuous activities, such as jogging, once heart rate goals are no longer attainable through a walking program. For others, simply walking aerobically can remain an adequate program. In essence, "the race is not always to the swift, but to those who keep moving...."

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Anabolic Steroids

Prowess, but at what price?

Athletes have been using anabolic steroids to enhance performance for at least three decades, but recently public awareness of this reality has spread. When Ben Johnson was stripped of his gold medal in the 1988 Summer Olympic Games for using an anabolic steroid, it's doubtful that many of us were truly shocked. Despite awareness of the use and benefits of anabolic steroids, much remains unknown about these substances, particularly how they act and what their long-term ill effects may be.

Side effects

Anabolic steroids are synthetic compounds that are related to the natural male steroid hormone, testosterone. They are referred to medically as "androgenic anabolic steroids," since they have both masculinizing (androgenic) and growth-enhancing (anabolic) effects. It should not be surprising, then, that many of their side effects involve the reproductive system (Table 1). In men, the effects of diminished sperm production and shrunken genitalia seem to be reversible after steroid use is discontinued; however, in women, genital enlargement, deepening of the voice, and abnormal hair growth appear to be permanent and irreversible. In both sexes, users may note enhancement of sex drive, but after long-term use, or withdrawal from use, it is common to see exactly the opposite effect.

Another worrisome side effect is the potential for premature closure of the bone growth plates in children and teenagers, which could lead to shorter than normal height. Minor side effects have also been reported, but these are variable, not occurring in all users (Table 2).

By now, the behavioral effects of anabolic steroid use are quite familiar. Euphoria, abnormal aggression (so-called "roid rage"), and unpredictable mood swings have been observed. There have been reports of true psychological addiction in some chronic users, an issue that is currently being discussed among experts.

Table 1

Side Effects of Anabolic Steroids

Men

- Decreased production of testosterone (hormone)
- Decreased and abnormal sperm production
- Shrinkage of genitalia
- Breast enlargement (gynecomastia)
- Acne
- Hair loss (balding)
- Adverse effect on sexual drive

Women

- Growth of facial hair
- Increased body hair
- Male-pattern baldness
- Deepening of voice
- Enlargement of genitalia
- Irregular or arrested periods
- Acne
- Reduction of breast size
- Adverse effect on sexual drive

Long-term effects

It is the long-term effects of anabolic steroids that are the least understood but potentially the most dangerous in terms of health consequences. A number of liver disorders have been seen, ranging from minor disturbances of liver function to reports of serious liver tumors, in some cases life-threatening. Other tumors have also been linked to anabolic steroid use. Although the number of case reports in young, otherwise healthy athletes is small, the implications are disturbing. Examples include prostate cancer, Wilm's tumor (a type of malignant kidney tumor), leukemia, and testicular cancer.

Finally, it should be mentioned that anabolic steroids have been proven to cause cholesterol disturbances, including elevated total blood cholesterol level, with reduction in the high-density, or beneficial, fraction of cholesterol. These abnormalities have been linked with increased risk for development of heart disease. Reports of heart attack and stroke in young users of anabolic steroids are increasing. If this link proves to be true, it could be the most devastating of all the adverse effects.

In light of these observations and documented effects, it would seem that a casual attitude toward the use of androgenic anabolic steroids to enhance performance or appearance is at least naive and at most dangerous. Although we are a long way from understanding all of their effects, an awareness of what is already known or being discovered can aid us in formulating rational attitudes toward the use and misuse of these substances.

Bill Cappiello, M.D.
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Table 2

Minor Side Effects

- Headache
- Muscle spasms
- Dizziness/nausea
- Fluid retention
- Skin rash
- Changes in appetite
- Pain or inflammation of genitalia

NUTRITION

Controlling Cholesterol

For a healthier heart

Cholesterol...*HEART DISEASE.* As research continues, the influence of cholesterol as a contributor to the increased risk of heart disease becomes clear. Heart disease kills nearly half a million Americans per year. Although no means of completely eradicating heart disease is currently known, controlling factors associated with increased risk seems prudent. That includes controlling cholesterol.

Cholesterol and fat

In this country, the average cholesterol level is more than 240 milligrams per deciliter (mg/dl), well above the accepted low risk level of no more than 200 mg/dl. Dietary intervention is the primary means of lowering blood cholesterol; however, the emphasis has shifted from cholesterol content in the diet to fat. Researchers have discovered that the type and level of fat in the diet can do more to affect cholesterol level than the actual amount of cholesterol consumed.

The American Heart Association now recommends that no more than 30% of total calories come from fat, and that the fat come from equal amounts of saturated, mono-unsaturated, and polyunsaturated sources. Although efforts to reduce fat in the diet have been underway for at least a decade, Americans still consume about 40% of their total dietary calories in fat, much of which comes from hidden sources. As much as half of the calories in home-prepared foods, as well as commercial food products (snack foods, pastries, convenience foods, etc.), may come from fat. High-fat meats and dairy products also contribute a large portion of the saturated fat in the American diet.

Cholesterol reduction and fiber

Fiber has been recognized recently as a cholesterol-lowering agent. Soluble fiber such as oat bran has been shown to reduce total and LDL cholesterol, a class of cholesterol elevated in people with heart disease. At the same time, the fiber may help increase HDL cholesterol, a type of cholesterol seen more frequently in people free of heart disease. Whole rolled oats or oat bran can be added to a low fat diet in the form of a breakfast cereal or as an additive to other foods, especially desserts, casseroles, or baked products.

Jessie Wright, M.S., R.D., L.D.
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"Nutrient Dense" Oatmeal Cookies

1/2 cup soft margarine
3/4 cup brown sugar, packed
1 egg
1/8 to 1/4 cup water
1 teaspoon vanilla
1 cup flour
1/2 teaspoon baking soda
1/2 cup raisins
3 cups "old fashioned" rolled oats

- Preheat oven to 350 degrees.
- Beat together margarine, sugar, egg, water, and vanilla until creamy.
- Combine flour and soda. Add to creamed mixture.
- Add raisins and rolled oats. Mix well.
- Drop by tablespoonfuls or roll into balls onto ungreased cookie sheet.
- Bake 12 to 15 minutes.

Makes 3 to 3 1/2 dozen cookies.

1 cookie = 50 calories
1.5 grams of fat
(25% of the calories come from fat.)
p : s = 2 : 1 (The ratio of polyunsaturated fat to saturated fat is 2 to 1.)

Ways To Lower Fat In Your Diet

Instead of	*Use*
Bacon	Canadian bacon
Ground beef	Ground chuck or round
Whole eggs	2 egg whites or an egg substitute
Ice cream	Sorbet or sherbet
Sour cream	Yogurt (plain)
Cream	Evaporated skim milk
Cheddar or Swiss cheese	Part skim mozzarella
Cream cheese	Neufchatel
Ribeye or chuck steak	Round or flank steak
Whole milk	Skim milk
Chocolate	Cocoa

Sources of Dietary Fat

Saturated fat:	animal fats/products, cheese, butter, coconut oil, chocolate
Monounsaturated fat:	olive and peanut oils
Polyunsaturated fat:	safflower, sunflower, corn, cottonseed, soybean, and sesame oils

The Ilizarov Technique

Russian technology improves treatment of fractures

Glastnost has allowed a little known technology to be brought to the West, a technology that may revolutionize the treatment of broken bones and deformed limbs. Commonly referred to as "the Ilizarov technique," this technology is named for its developer, G. A. Ilizarov, MD, PhD, who conceived the technique and has refined it over the past 35 years at his clinic in the Siberian industrial area of Kurgan. Only in the last few years has the technology emerged outside the Soviet Union.

Traditional fracture treatments

Fractures, or broken bones, have been treated by a variety of means, depending on the nature of the injury. In many cases, the bones may be

realigned and held in a cast, brace, or splint until healed. For particularly bad breaks, surgery is performed and the bone fragments are fixed in place with plates, pins, or screws. A compromise between these methods is the insertion of metal pins into the bone through small puncture wounds in the skin. The pins are then connected to an external frame that can be adjusted to realign the fragments. This method, referred to as *external fixation,* has its greatest application in patients with multiple injuries (who cannot tolerate extensive operative procedures immediately) and in some unique fracture patterns.

The Ilizarov Technique

The Ilizarov system is basically an external fixation device, but with some subtle differences. Instead of pins, fine wires are connected to external rings and tensioned for added stability. The rings are interconnected by means of adjustable rods. By adjusting nuts and bolts on the rings in any of over 600 different configurations, a bone can be lengthened, widened, or moved in any direction, along with its muscle, nerve, and blood supply.

In actuality, what Dr. Ilizarov has discovered is not just a device, but a previously unknown means by which bone heals and even regenerates. By use of his external fixation device and some innovative surgical techniques, bones can be lengthened, angular deformities straightened, and difficult fractures united. These capabilities are expanding the options available to people with short or deformed limbs or those who have lost a significant segment of bone to trauma or disease.

Benefits go beyond this. Because fragments are stabilized, patients are up and around right away. The complications that follow prolonged bedrest can therefore be avoided. Return home and to school or work may be accelerated by as much as 25%.

What can we expect?

The Ilizarov external fixator is being used at a growing number of institutions here in the U.S. and abroad, but more time and experience will be needed before its use becomes commonplace. Early results highlight the extreme complexity and technical

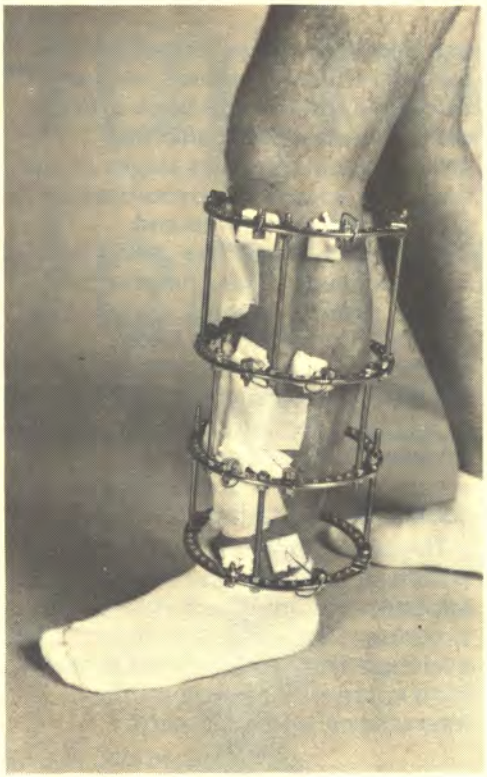

Photo by Y. Ehrhart

difficulty of the device. Medical reports on the technique still exist mainly in the Russian language, making it difficult for surgeons to share information except by direct teaching. Dr. Stuart Green, of Los Alamitos, California, one of a handful of American surgeons who have traveled to Russia and studied with Dr. Ilizarov, recently visited the Hughston Sports Medicine Foundation and shared his experiences.

As research continues, uses for Ilizarov technology are likely to increase. To quote Dr. Green, "This is not just another external fixator. It's a whole new system. We may someday be able to use it for 40% to 50% of what we commonly treat."

Greg Hess, M.D.
Richard Sanders, M.D.
Columbus, Georgia

EQUIPMENT REVIEW

Tennis Elbow Braces

If you suffer from "tennis elbow," you are not alone. Up to 50% of tennis players experience these painful symptoms (and so do non-tennis players). Tennis elbow, or lateral epicondylitis, is inflammation and degeneration of the tendons that attach the forearm muscles to the elbow. It is characterized by pain on the outside of the elbow, especially with any activity in which the wrist is extended, or bent backward.

Whatever the cause, treatment for tennis elbow may consist of a combination of medication, massage, modality treatments (heat, ice, ultrasound, etc.), and exercise. Tennis elbow braces, pioneered in the early 1970s, are now available from numerous manufacturers. While they should not be the sole treatment, they may allow an earlier resumption of activity during the rehabilitation period.

When selecting a tennis elbow brace, consider these points. The brace need not come above the elbow, but should consist of a wide support that is contoured to fit the conical shape of the upper part of your forearm. There are several different types of braces, but the important factor is that the brace have a wide area of contact with the muscles on the outside of the upper forearm. The brace should *not* be elastic and should fit snugly, but not so tight that it causes discomfort. The brace functions as a counterforce, transferring strain away from the injured tissues, decreasing the force built up within the muscles, and thus the amount of pull and discomfort felt at the elbow.

For the tennis elbow sufferer who is contemplating a return to play, using correct technique in hitting the ball and choosing the proper equipment are helpful strategies. Improved swing mechanics, particularly with the backhand, will often ease symptoms. A lightweight racquet that is not strung too tightly and has the proper grip size is appropriate for most players. A larger racquet head size with a large "sweet spot" may also help reduce the stress near the elbow. Of critical importance are proper stretching and strengthening exercises prior to play. This is especially effective in avoiding reinjury.

Tennis elbow may take from 6 weeks to 6 months or longer to improve. A number of other disorders in the forearm and elbow can mimic tennis elbow, so **your personal physician should always be consulted for proper treatment.**

Pat O'Connell, M.D.
Columbus, Georgia

New Books

Eat to Compete: A Guide to Sports Nutrition, by Marilyn Peterson, M.S., R.D., and Keith Peterson, D.O. Chicago, Year Book Medical Publishers, 1988 (paper).

Written by a registered dietitian with many years of experience in sports nutrition and an experienced sports medicine physician, this book is for athletes and people who advise athletes on nutritional matters.

The chapter on digestion, metabolism, and energy balance is especially concise and easy to understand. Factors that influence fuel use (nicotine, drugs, carbohydrate loading, chronic diseases, etc.) are discussed briefly. The book also discusses conditions affecting performance at various stages of the life cycle, as well as environmental factors such as altitude and temperature. There is a useful table of ergogenic aids, their composition, claims, proven benefits, and adverse effects. Information on body composition and dietary data collection and analysis forms the basis of a how-to section in which problem-oriented interventions and recommendations appear in a cookbook-type fashion.

The book's greatest plus is its wealth of reference information. The appendix includes such data as the American Diabetic Association's food exchange lists, various meal patterns, food composition, drug-nutrient interactions, and a glossary.

Jessie Wright, M.S., R.D., L.D.
Columbus, Georgia

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