

# THE SAVVY WOMAN PATIENT

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How and Why Sex Differences  
Affect Your Health

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CAPITAL SAVVY SERIES



## CHAPTER 6

# Bone and Muscle Health

**A**s our country's population ages, maintaining the best possible quality of life is essential. Everyone, men and women alike, seeks the goal of the ancient Greeks: "To die young—at the oldest possible age." Bone and muscle health are critical to maintaining an active and rewarding lifestyle for people of all ages. The fitness of bones and joints determines, to a greater extent than any other factor, how well people do as they age.

Bone and muscle disease, and the resulting pain and disability, affect our capacity to perform functions of daily life and maintain independence. The extent of such disability has recently been documented in a major long-term study, the Women's Health and Aging study, which involved some 1,000 women over age 65, all of whom were living in one community at the time the study began in 1992. The study revealed that 32 percent of American women age 70 and older have difficulty performing, or are unable to perform, basic self-care activities. Musculoskeletal pain was the most common self-reported cause of disability among these women; the second and third causes, weakness and balance difficulties, were directly related to musculoskeletal health. Among women who were unable to provide basic self-care, 37–58 percent attributed their difficulties to musculoskeletal pain. Pain stemming from musculoskeletal disorders likewise restricts women's ability to walk, leading to further physical deterioration and loss of independence.

This chapter discusses the most common bone problems in women, including sports injuries, osteoarthritis, and osteoporosis, as well as a section on musculoskeletal health during pregnancy.

## Bone Basics

The musculoskeletal system includes bones and the muscles and the connective tissues that bind them together. When this system works properly, there is full-range, painless motion. The human body has 206 bones, whose primary function is to support the body. The ends of the bones are covered with cartilage, which serves as a cushion between the bones. The

bones come together at joints, which allow the skeleton to be flexible. The bones are connected at the joints by fibrous tissue called ligaments, and they are lined with a thin membrane, called the synovium. The synovial membrane produces fluid that provides nutrition for the cartilage and lubricates the joint, reducing friction and wear and tear. Muscles, which are responsible for movement, are attached to bones by tendons.

In addition to supporting the body, bones encase and protect certain organs. For example, the rib cage shields the lungs and heart. Bones also serve as a storehouse for fat and for such minerals as calcium and phosphorus. These stored minerals are released into the bloodstream and are carried to all parts of the body as needed. Inside the bones is a cavity filled with soft tissue, called marrow, which produces the red blood cells.

Bone growth is ongoing during the first 25 years of life. During adolescence, a growth spurt changes the skeletal structure. Legs become relatively longer, hips and chest become wider, and the torso lengthens. Men and women both gain 50 percent of their bone mass between the ages of 10 and 20. Most young women have completed their growth by age 14. Between age 20 and 30, bone mass increases only slightly.

Bone, like all other tissue, is made up of cells and mineralized matrix that are constantly dying and being renewed. The process by which old bone breaks down and is replaced by new bone is called remodeling.

Heredity has the strongest role in determining bone mass and the rate of bone formation and loss. However, bone growth and loss are also affected by lifestyle factors, the most important of which are diet and exercise. Taking measures to ensure bone health needs to start in childhood; individuals who have calcium deficiency during their adolescence may not achieve their optimal bone mass. Unfortunately, as many as 85 percent of adolescent girls, compared with just 43 percent of adolescent boys, consume less than the recommended daily allowance of calcium. Estimates of daily calcium consumption by adult women are even lower.

Exercise is also essential. Recent research suggests that exercise may be even more important than dietary calcium in helping children reach the highest possible peak bone mass. For example, researchers in Canada reported that girls who engaged in jumping, a high-impact exercise, for 10 minutes a day, three times a week, over a 20-month period, had approximately 3–4 percent more bone mass than did girls who did not do the exercise. Although these differences seem minor, small differences in bone density can make a significant difference in reducing fracture risk. Girls in both study groups were similar in terms of body composition, size, overall physical activity, and calcium intake.

### WHY YOUR SEX MATTERS

The bones in the adult female skeleton are the same shape as the bones in the male skeleton; the sole difference is that women's bones are generally smaller. One exception is the pelvis. A woman's pelvis is usually broader than a man's and has a larger space in the middle. This shape allows for the head of a baby to pass from the uterus through the pelvis during childbirth.

Despite these similarities, the factors that affect bone health are different for men than for women. Women are nearly twice as likely to develop osteoarthritis and osteoporosis as are men. Despite ongoing bone remodeling, once an individual reaches peak bone mass, no additional bone growth occurs. As a person ages, more bone is broken down than is replaced. The resulting loss in bone mass is a normal occurrence for both men and women. The rates of loss, however, differ. Women, for example, have a sharp drop in bone mass as a result of the hormonal changes associated with menopause; however, after age 60, women's rate of bone loss is identical to that of men. By age 80, both men and women have experienced a significant decrease in total bone mass. Attaining maximum peak bone mass is extremely important, because this mass is the "capital" in an individual's bone bank.

## What Is Osteoporosis?

Osteoporosis is characterized by progressive bone loss and an increased risk of fracture. It literally means "porous bone." Because the changes in bone are at the microscopic level, and the disease initially produces no pain or other outward symptoms, osteoporosis often goes unnoticed for years. As a person ages, it causes loss of height and, in some cases, a dowager's hump, or rounded back. Osteoporosis affects some 28 million Americans. The term, bone mineral density, or BMD, is used to describe bone strength. The lower the BMD, the more porous and weaker the bone.

### CAUSES AND RISK FACTORS

Although the exact cause of osteoporosis is not known, a number of factors do increase the risk. There is clear evidence of a genetic predisposition to osteoporosis. For women, excessive loss of bone occurs when certain hormones essential for bone formation and maintenance decrease substantially following menopause. If the body does not receive enough dietary calcium to meet its needs, it takes calcium from the bones to make

up the difference. In premenopausal women, the sex hormone, estrogen, protects bones from being robbed of calcium by other demands of the body and helps produce and maintain collagen, an important component of bone. Once estrogen levels are depleted, it can no longer play this protective role. Another hormone, calcitonin, may facilitate the uptake of calcium from the blood into the bone and, at the same time, inhibit the loss of calcium from the bone. Other known risk factors include being underweight, tobacco use, excessive alcohol use, and certain medications.

On the basis of criteria set forth by a World Health Organization (WHO) expert panel, 54 percent of postmenopausal white women in northern parts of the United States have osteopenia, or low bone mass, and an additional 30 percent have osteoporosis in at least one skeletal site. Osteoporosis occurs in all racial groups. For example, 13–16 percent of Hispanic women have osteoporosis; as many as 49 percent of Mexican American women age 50 and older have low bone density; about 10 percent of African American women over age 50 have osteoporosis; and an additional 30 percent have low bone density. Between 80 and 95 percent of all fractures experienced by African American women over age 64 are related to osteoporosis.

#### DIAGNOSIS

Osteoporosis is diagnosed on the basis of a medical history and physical examination, skeletal x-rays, bone densitometry, and laboratory tests. Bone densitometry is an x-ray technique that compares a patient's BMD to the BMD that someone of the patient's sex and ethnicity should have reached at about age 20–25, when bone density is at its highest. Doctors use several types of bone densitometry to detect bone loss in different areas of the body. Dual beam x-ray absorptiometry (DEXA) is one of the most accurate methods, but other techniques can also identify osteoporosis. These include single photon absorptiometry, quantitative computed tomography (CT), and ultrasound.

WHO has defined osteoporosis as bone mineral density measuring two and one-half standard deviations or more below the young adult mean. The test is often performed in women at the time of menopause. Bone densitometry is used not only to diagnose osteoporosis but also to monitor the effects of treatment.

#### PREVENTION

Once bone mass is lost, it is difficult or impossible to replace. For this reason, preventing osteoporosis is vital. It is important to do everything you can to build peak bone mass by age 25 and then to ensure that the

inevitable loss of bone occurs as slowly as possible. Prevention entails a variety of measures, including the following:

- ◆ Monitoring calcium and vitamin D intake. Calcium requirements depend primarily on age. The Institute of Medicine offers the following guidelines for daily calcium intake:
  - children from 4 to 8: 800 milligrams (mg)
  - children from 9 to 18: 1,300 mg
  - men and women age 19–50 (including pregnant and nursing women): 1,000 mg
  - pregnant and nursing women under age 18: 1,300 mg
  - men and women over age 50: 1,200 mg

Dairy products, especially those low in fat such as skim milk and low-fat yogurt, are an excellent source of calcium. An eight-ounce glass of skim milk provides 300 mg of calcium and only 90 calories.

Women who are lactose intolerant and vegans, as well as anyone who wants a varied, calcium-rich diet, can turn to dark-green leafy vegetables such as kale, broccoli, and mustard greens; soy milk and other soy products such as tofu; salmon (with edible bones); and calcium-fortified fruit juices and breakfast cereals.

Vitamin D is essential for calcium absorption and for muscle strength. There is, moreover, increasing evidence that a vitamin D deficiency may increase fracture risk. The skin manufactures vitamin D when exposed to the sun; however, widespread use of sunscreens has reduced the role of natural light in preventing vitamin D deficiency. In addition, older people who are rarely out of doors need a supplemental source of this essential vitamin.

- ◆ Overall nutrition. A high protein intake has been shown to be associated with a lower risk of hip fracture in men and women between age 50 and 69, although not in older individuals. Contrary to earlier reports, there is no conclusive evidence that the carbonation in beverages has an adverse effect on bone health. It is possible, however, that the caffeine in some carbonated beverages increases calcium excretion. Drinking large quantities of carbonated beverages rather than milk also deprives the body of a major calcium source. Finally, recent research has indicated that vitamin B12 may be an important link in preventing osteoporosis. Good sources of this vitamin include low-fat dairy products, fish and lean meat, and eggs. The ability to absorb B12 from food decreases with age, so a vitamin supplement may be advisable for older women.

- ◆ Exercising. Women of all ages should engage in regular weight-bearing exercise. Walking is one of the best methods ways to maintain bone strength. Other weight-bearing exercises include jogging, hiking, tennis, bicycling, dancing, aquatic exercises (but not swimming), and weight training. Choose an exercise that combines movement with impact on the limbs. Start exercising slowly, especially if you have been inactive. Because falls are the most common cause of fractures, do some balance activities to reduce your risk. The benefits of tai chi in particular have been documented. Consult your doctor before beginning any exercise program.
- ◆ Cutting out smoking and reducing alcohol intake. Eliminate smoking and excessive alcohol use; these cause bone loss and increase your risk of a fracture.

#### TREATMENT

Controlled trials involving thousands of women have shown that a number of medications are effective in reducing bone fracture risk in women with osteoporosis. Treatment is often a team effort involving a family physician or internist, an orthopaedic surgeon, a gynecologist, and an endocrinologist.

Hormone therapy (HT) is often recommended to prevent bone loss and reduce fracture risk in postmenopausal women. This therapy may consist of estrogen alone (ERT) or estrogen plus progestin. Such therapy can be effective; for example, a study done as part of the Women's Health Initiative (WHI) showed a 34 percent reduction in hip fracture risk among women taking estrogen plus progestin, compared with women of a similar age who were not taking this drug. Because there also was an increased incidence of breast cancer and various types of circulatory problems found in women in the WHI study, hormone therapy is no longer the agent of choice for prevention of osteoporotic fractures in women over age 50. If you had been taking HT and stopped or are at menopause and do not intend to start HT, you need to talk with your doctor about alternatives to prevent bone loss.

New antiestrogens known as specific estrogen receptor modulators (SERMs) have been introduced. A three-year trial of the SERM, raloxifene, showed that it was associated with a 2–4 percent increase in spine and hip bone mineral density, a 30 percent reduction in the incidence of new vertebral fractures in women with existing vertebral fractures, and a 50 percent decrease in new vertebral fractures in women without pre-existing fractures.

Bisphosphonates are currently the drugs of choice to prevent bone

loss after fracture. These products, called antiresorptive drugs, slow the rate of bone loss and increase bone density. They include alendronate, risedronate, and etidronate. Etidronate was among the first bisphosphonates to be developed. Although it increases bone mineral density slightly and reduces vertebral fracture risk somewhat, it may actually impair bone mineralization over the long term. For this reason, it is not a first-line agent for treatment of fragility fractures. Alendronate and risedronate have both shown convincing evidence of effectiveness. Women in clinical trials with these two medications have shown BMD increases of 3–10 percent and a reduced risk of vertebral fracture of up to 50 percent. In addition, these are the only two therapies that have been shown to reduce hip fracture risk. The older bisphosphonates are taken once a week. The U.S. Food and Drug Administration (FDA) has recently approved another bisphosphonate, ibandronate, which can be taken in a single, monthly dose. Ibandronate has been shown to reduce spinal fracture risk by up to 50 percent and to increase bone density at all sites, but no hip fracture data are yet available.

The only FDA-approved product that builds new bone, as opposed to slowing the rate of bone loss by limiting bone breakdown, is teriparatide, which is given as an injection to patients with a history of fractures or those who are at high risk for them.

Calcitonin, available in oral or nasal spray form, is an older medication used to decrease bone loss. Taken alone, calcitonin is not nearly as effective as bisphosphonates, SERMs, or hormone therapy.

### FRAGILITY FRACTURES

Osteoporosis is often called a silent disease because it has no symptoms in its early stage. In fact, bone fracture is often the first indication of osteoporosis. Fractures caused by osteoporosis are typically called fragility fractures—fractures that occur as a result of a relatively minor injury or blow, such as falling from standing height or less. The most common sites of fragility fractures are the vertebrae, hip, wrist, and shoulder. Osteoporosis is a contributing factor in as many as 1.5 million fractures each year.

Fractures of the hip are among the most debilitating and costly consequences of osteoporosis. Among those at greatest risk for hip fracture are women over age 65. Slender, small-boned women may be more prone to such fractures than are large, heavy-boned women. A family history of fractures in later life is another risk factor. Women who have a low dietary intake of calcium, who smoke, or who drink alcohol excessively are also at higher risk, as are those with arthritis or poor balance, coordination, and eyesight.

In women over age 75, the most commonly performed surgery is repair of a hip fracture. And, although modern orthopaedic surgical techniques and care can assist in healing of the bone, most hip fracture patients require extended periods of rehabilitation. Around one of every four people who have an osteoporotic hip fracture need long-term nursing home care, and virtually all these patients need extended assistance from their families or home care providers. Walking aids may be necessary for several months after the injury, and many patients permanently require canes or walkers to move around their homes or outdoors.

Prevention of hip fractures is far less costly, in both financial and human terms, than treatment after the bone is broken. A diet high in calcium and vitamin D, regular exercise, and the correct medications can help prevent weak bones and the possibility of hip fracture.

Paying attention to home safety is also important, especially for older women. Most of these injuries occur as a result of a fall, and most falls occur in the home. AARP recommends taking the following measures to “fall-proof” your surroundings:

- ◆ Remove the clutter, pick up papers or clothes from the ground, move garbage bins under cabinets.
- ◆ Keep living areas well lit.
- ◆ Be aware of your surroundings. Know where your furniture is placed and any stairs or change of entry levels.
- ◆ Clean up any spills.
- ◆ Be sure that your furniture is stable.
- ◆ Use nonslip mats in the bathtub and on shower floors.
- ◆ Secure area rugs with double-faced tape, tacks, or slip-resistant backing.

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### *Get the Facts: Menopause Is Nothing to Fear*

By Cheryl Ladd, actor, singer, humanitarian, and author of *Token Chick: A Woman's Guide to Golfing with the Boys*

*At 46, menopause was the last thing on my mind. I felt young, healthy, and vibrant. When I began experiencing unfamiliar symptoms, including night sweats and mood swings, it never occurred to me that I might be entering menopause.*

*I did a little research and found out that my symptoms might be related to estrogen loss. I began to work through the first phase of*

*my denial—it was time to admit I was experiencing the onset of menopause.*

*Even when I started to entertain the notion that these changes might signal menopause, I denied that I needed to speak with someone about it. After all, I was doing everything right. I ate well, exercised, and took a daily calcium supplement—all the things I was supposed to do to protect my health.*

*I didn't realize that some serious health conditions for women can come on silently, without any noticeable symptoms at all. A woman may have no idea, for instance, that she's developed high blood pressure or elevated cholesterol until a heart attack occurs. Likewise, osteoporosis may not reveal itself until a fracture occurs from a simple fall.*

*I considered myself informed on health matters and thought I could handle menopause without too much trouble. Only later did I realize that this was another form of denial.*

*Eventually, my mood swings got to a point that my husband asked me to please speak with the doctor. I was always such an upbeat person, yet I had begun spending time in bed, weeping. It was so unlike me.*

*People have said menopausal symptoms are in a woman's head, but I know they're real. My doctor helped me understand what was happening to me and what it meant; he explained the various risks posed by estrogen loss. He gave me the information I needed to work with him to develop a health plan that is right for me. When you have this kind of discussion with your doctor, you become part of the team.*

*When we first talked, my doctor suggested I take a bone mineral density test. I'd been a gymnast and a dancer and had stayed physically active my whole life. I felt my bones were protected by my healthy lifestyle. I was sure I had the bones of a 20-year-old. Imagine my surprise when the results came in that I had already experienced early menopausal bone loss in my left hip!*

*As a petite, fair woman I knew I was at risk for osteoporosis, but I was not aware that the estrogen loss of menopause increased that risk.*

*I found menopause to be an unnerving, confusing time and was dismayed at the lack of clear, straightforward information available until I started speaking with my doctor. With information like I received from my doctor, all women can celebrate menopause as the transition to a new phase in their lives and make it a less fearful time, no matter what treatment option they decide is right for them.*

(Reprinted with permission by Cheryl Ladd)



## What Is Osteoarthritis?

Osteoarthritis (OA) develops when the cartilage covering the bone ends gradually wears away. For these reasons, OA is sometimes called “wear-and-tear” disease. In many cases, bone growths, or spurs, develop in the joints. Athletes may develop OA at a young age, particularly due to injuries of the knee that subsequently promote wear and tear of the joint. In OA, the joints become inflamed and swollen, and continued use of the joint is painful. Osteoarthritis is often more painful in weight-bearing joints such as the knee, hip, and spine than it is in the wrist, elbow, and shoulder joints.

Arthritis affects each person differently. It may progress quickly or slowly. Occasionally, the disease progresses rapidly to the point where the patient is disabled within a few years of the onset of joint pain. Far more commonly, however, the disease progresses over years or even decades. One national survey found that 59 percent of people in the United States age 65 years or older reported arthritis or chronic joint symptoms. Osteoarthritis is significantly more prevalent in women than in men, and the prevalence in all joints and all populations increases dramatically with age.

### RISK FACTORS

Osteoarthritis has a strong genetic connection, but there are other risk factors as well that can increase one’s risk of developing OA. One of them, as noted above, is female sex. Others include:

- ◆ Obesity. Generally, the more weight a person carries, the greater the pressure is on weight-bearing joints (hip and knee) of the body.
- ◆ Aging. As people age, cartilage normally is less able to repair itself.
- ◆ Nutrition. Calcium and vitamins C and D are needed to build strong bones. Investigators are researching whether an insufficiency of these vitamins may contribute to developing OA in later life.
- ◆ Presence of other diseases and hereditary conditions that affect bones and connective tissues. These include unusual medical problems such as Ehlers-Danlos syndrome, bone dysplasia, and Charcot’s joint.
- ◆ Injury or deformity in a joint. There is an increased risk of developing OA in a joint that is not properly aligned or in one that has been injured.

- ◆ Occupational factors. People who engage in repetitive tasks may overwork their joints and overtire muscles that protect the joints, which increases the risk of OA in that joint.

### SYMPTOMS

The following symptoms may signal osteoarthritis:

- ◆ steady or occasional pain in a joint,
- ◆ joint stiffness on getting up in the morning or after sitting for a long time,
- ◆ swelling or tenderness in a joint, and
- ◆ a feeling of crunching or the sound of bone rubbing on bone.

### DIAGNOSIS

Diagnosing osteoarthritis typically includes evaluating symptoms, a physical examination, and x-rays, which show the extent of damage to the joint. Blood tests and other laboratory tests may help determine the type of arthritis.

### TREATMENT

Most women with arthritis can continue to perform normal activities of daily living. Exercise programs, anti-inflammatory drugs, and weight reduction for those who are obese can help reduce pain and stiffness and improve function. The goals of treatment are to provide pain relief, increase motion, and improve strength, thus slowing the progression of the arthritis. Treatment includes exercise, medications, surgery, and using assistive devices:

- ◆ Exercise. Exercise has many benefits. It can help keep your body strong and limber, expand your range of motion, and help control weight. Exercises that many women find helpful include strength exercise, aerobic exercises, range-of-motion activities, and neck and back strength exercises. Moderate exercise such as regular walking can keep the body supple and reduce joint pain and stiffness. Many people also find yoga helpful. Check with your doctor or physical therapist to design a plan that helps strength your body without taxing it too much.
- ◆ Medications. A wide range of medications can be used to relieve the pain and inflammation of arthritis. Some are available over the counter; others require a doctor's prescription. Each medication has advantages and disadvantages, and it is important to

work with your doctor and health care team to choose the one that is best for you.

Acetaminophen may be used to control mild-to-moderate arthritis pain and is often the first medication recommended. It does not relieve the inflammation, however. Instructions on the medication bottle need to be followed to avoid problems. People who drink alcohol should discuss the use of acetaminophen with their physician, as they may be at higher risk for liver damage.

A large class of drugs, called nonsteroidal anti-inflammatory drugs (NSAIDs) is widely used to relieve both the pain and inflammation of arthritis. The older NSAIDs include aspirin, ibuprofen, and naproxen. These drugs, available over the counter, are known to produce gastrointestinal side effects. In some cases, these side effects are limited to minor discomfort, but they may include gastric bleeding. It is important not to exceed the recommended doses and to take these drugs with food or milk to minimize their risk of side effects. These drugs should not be taken for more than 10 days, unless advised to do so by a doctor. If one NSAID causes stomach irritation, you might switch to another one. Another possibility is to combine the NSAID with a drug that protects your stomach lining.

Introduced in 1998, COX-II inhibitors are the newest class of NSAIDs. Compared with older NSAIDs, their chief advantage is that they do not produce gastrointestinal (GI) side effects. They are more expensive, but there is no evidence that they reduce pain and inflammation any better than over-the-counter (OTC) products, and they became the subject of considerable concern in late 2004 and early 2005, prompting the FDA to recommend limiting the use of both of these drugs. The controversy over COX-II inhibitors drew wide media attention and caused great confusion among patients. The best course of action is to work with your physician to determine what drug works best—and is safest—for you.

The current concern over drug safety has prompted many patients to explore other treatment options. For example, liquid cortisone, injected into the joint, may help relieve pain and swelling temporarily. Topical pain relievers are also an option; some contain salicylate, a chemical related to aspirin. Another class of products are the counterirritants, which cause hot or cold feelings that temporarily mask the pain. Finally, some products contain capsaicin, the active ingredient in hot peppers; they work by interfering in the process by which the nerves send pain signals to the brain.

For persons with moderate arthritis of the knee, injections of material to improve the joint fluid may improve pain. These materials, termed hyaluronic acid supplements, are injected into the knee once a week for three to six weeks. These injections are considered a second line of treatment after oral medications. If an individual's pain is not improved with medication such as acetaminophen or an NSAID, or if they cannot tolerate NSAIDs because of GI problems, they may be a candidate for a series of hyaluronic acid injections.

Well before the risks associated with COX-II inhibitors came to public attention, many people were turning to alternative therapies for relief of arthritis. One such therapy is acupuncture, which has been shown to reduce knee pain and improve function for people with osteoarthritis when used in conjunction with medical therapy. In one study, people who received acupuncture (the study group) had a 40 percent decrease in pain and a nearly 40 percent increase in function, compared to people who received sham treatment (the control group).

Many people with osteoarthritis find relief by taking glucosamine and chondroitin, two natural substances sold as dietary supplements. Laboratory tests have found that both of these products can make the cartilage healthier and perhaps even repair it. Large-scale trials of effectiveness are ongoing.

If you are interested in using these or any other complementary medicines, be sure to talk with your physician first. Herbal supplements may interact with prescription or OTC medications. For example, glucosamine is a type of sugar, and if you take it and have diabetes, you will need to monitor your blood sugar levels more frequently. Additionally, if you are allergic to shellfish, you need to be aware that glucosamine is extracted from shellfish. Chondroitin may interact with blood-thinning drugs.

The effectiveness of many other alternative approaches to arthritis pain relief, including wearing magnetic bracelets, has not been proved in scientific studies.

- ◆ Assistive Devices. Canes, crutches, walkers, or splints may help relieve the stress and strain on arthritic joints. Learning how to perform daily activities in a way that is less stressful to painful joints also may be helpful. Certain exercises and physical therapy (such as heat treatments) may decrease stiffness and strengthen the muscles around the joint.
- ◆ Surgery. When medicines, injections, and other therapies are no longer effective in controlling pain and restoring function, sur-

gery may be appropriate. Different types of operations that may help a person with arthritis include:

- operations to realign a joint (osteotomy) and take stress off the worn region of the joint;
- fusing the joint (arthrodesis) to make it stiff and unable to move (and thus pain-free); and
- joint replacement (arthroplasty). Joint-replacement surgery can often provide dramatic pain relief and restore joint function in persons with severe OA. During this procedure, an orthopaedic surgeon replaces the diseased joint with an implant made of metal, ceramic, plastic, or a combination of these. Like a healthy joint, the artificial one also has smooth, gliding surfaces. A total joint replacement can usually enable a person with severe arthritis in the hip or the knee to walk without pain or stiffness. The physician and patient choose the type of surgery by taking into account the type of arthritis, its severity, and the patient's physical condition.

The decision about when to replace a diseased joint is also based on a number of factors, including the degree of disability, lifestyle, age, and the patient's ability to withstand the risks of surgery. Many patients try to postpone surgery as long as they can, and for many years, physicians, too, recommended delaying the procedure in patients over age 60. There is, however, increasing evidence that waiting too long can make the procedure more complicated, because more bone and cartilage may already be worn away. Increased age puts a patient at greater risk after surgery, and a patient who has been debilitated by arthritis for an extended period may find recovery more prolonged. Reflecting this growing body of evidence, in 2004, a National Institutes of Health consensus panel reported its conclusion that people with less pain and better function before knee replacement do better following surgery than those who were more impaired before surgery.

Joint replacement surgery of the hip and knee may now be done with less invasive techniques. These procedures focus on less injury to the skin, muscles, and tendons and may promote faster recovery. Evidence to date shows no clear difference in outcomes one year following surgery between patients whose surgery is performed using a minimally invasive versus traditional approach. It may be more difficult to put in the implants through a smaller incision, and this may compromise how long the joint lasts. Individuals considering joint replacement surgery should discuss the surgical options with their surgeon.

## Sport and Exercise Injuries

Exercise is essential for development and maintenance of bone mass, yet few Americans get the amount of exercise recommended by the U.S. Surgeon General, and inactivity is more than twice as common among women as it is among men. Women of color, women older than age 40, and women without a college education have the lowest levels of participation in leisure-time physical activity.

But there is also some good news: Although women in general, and particularly older women, do not get sufficient exercise, the number of girls and women participating in organized sports has been on the rise. Participation of women in sports has increased dramatically since Title IX of the Education Amendments Act was enacted in 1972. In addition, job opportunities that require high levels of fitness have been opened to women. Women now account for more than one-third of all college athletes and recent United States Olympic team members.

### WHAT IS ARTHROSCOPIC SURGERY?

The term, arthroscopic surgery, probably appears more in the sports section of your daily newspaper than in the health section, because many athletes undergo these procedures. The word comes from the Greek root words, *arthron* and *skopos*; in the literal translation “to look at the joint.” During arthroscopic surgery, the orthopaedist inserts a long, thin metal tube into a small incision made near the joint. Inside the tube are coated-glass fibers and a series of magnifying lenses. The fibers carry light into the joint and relay a magnified image that is projected onto a video screen or that can be viewed through an eyepiece. One major advantage of arthroscopic surgery is that it requires only a small incision. Before this technique, surgeons had to make large incisions, and wound healing took much longer. Arthroscopic surgery is performed on an outpatient basis under local anesthesia; it is also used for diagnosis.

### WHY YOUR SEX MATTERS

Research on sports injuries indicates that injury patterns generally are sport-specific, not sex or gender-specific. There are exceptions, however. Knee injuries and stress fractures of the vertebrae, pelvis, and hip and pelvic floor dysfunction, for example, affect women in greater proportion than they do men.

The reasons for differences in injury rate are the topic of ongoing research. There are distinct differences between the male and female physique that may be at the base of some of the differences in injury rates. For example, women have more body fat and less lean body mass than men; this is a natural consequence of increased estrogen in women and androgen in men. Although men and women have comparable lower-body strength, females have less upper-body strength, even after undergoing training and adjusting for differences in weight and size. Among the most significant male/female differences from the point of view of injury is different alignment of the lower body; women have a wider pelvis, their knees are in greater valgus (knock-kneed position), and their feet are more pronated (rolled in), all factors that may contribute to the disproportionate number of knee injuries in women. Issues of particular concern relating to women's musculoskeletal health and sports and exercise are highlighted below.

#### WHAT IS FEMALE ATHLETIC TRIAD?

Far too often, female athletes mistakenly think that a childlike body and extremely low weight are essential for excellence in sports. Given this widespread belief, it is not surprising that a high proportion of female athletes suffer from eating disorders such as anorexia and bulimia. Poor eating habits, in turn, lead to a group of health problems that has been called the female athletic triad:

- ◆ abnormal eating habits, such as crash diets and binge eating;
- ◆ menstrual dysfunction (athletic amenorrhea) caused by poor nutrition, low calorie intake, high energy demands, physical and emotional stress, or a low percentage of body fat; and
- ◆ osteoporosis: the low estrogen levels associated with amenorrhea interrupt the body's bone-building processes and weaken the skeleton, making the bones more likely to break. A woman with such bone deterioration during adolescence may never achieve the peak bone mass that she otherwise would.

At greatest risk are women in demanding sports that also reward physical appearance (for example, figure skating, gymnastics) or improved performance (for example, distance running, rowing). The condition is disturbingly common: up to 20 percent of vigorously exercising women, and half of all female professional ballet dancers, may have amenorrhea. Fashion trends and advertising often encourage all women to try to reach unhealthy weight levels. Some female athletes suffer from low self-esteem or depression and may focus on weight loss because they

think they are heavier than they actually are. Others feel pressure to lose weight from athletic coaches or parents.

The condition may be difficult to diagnose; one of the early symptoms may be a stress fracture. The best treatment for this syndrome is prevention. Girls or women who already have the condition may benefit from counseling as well as the guidance of a physician and dietitian. Parents and coaches should be on the alert for symptoms of the triad and know how to intervene.

### KNEE INJURIES

The knee is the most commonly injured joint, and the spectrum of such injuries ranges from mild (runner's knee and tendonitis) to severe. Among the most common serious knee injuries is damage to the anterior cruciate ligament (ACL), which keeps the knee stabilized and prevents the leg bone from sliding forward beneath the thigh bone during twisting or pivoting movements. ACL injuries occur most often in people engaging in such sports as soccer, basketball, and volleyball, which require fast stops, starts, and turns. ACL injury rates are two to eight times higher in women than they are in men participating in the same sports. For example, the rate of ACL injuries among female soccer players is four times that of their male counterparts.

#### *Why Your Sex Matters*

One reason for the discrepancy is anatomy. In addition, females place more emphasis on their quadriceps muscles than males do, which may partly explain the increased risk of ACL injuries in women. Women also tend to land on a flat foot rather than on their toes, and with less hip and knee flexion, than men do. This can also contribute to the increased injury rate in women. Differences in training, neuromuscular response, and hormonal response may also play a role.

#### *Treatment*

Treatment of ACL injuries requires rehabilitation to restore range of motion, strength, and balance. Women who do not participate in sports that require jumping, cutting, or pivoting, or women who plan to stop competing, may decide to follow a nonsurgical approach. However, women who intend to continue in sports, particularly those that involve jumping, cutting, or pivoting, are typically offered surgery. The goal of surgery is to improve stability and reduce the risk of future injuries. Research demonstrates similar outcomes in male and female patients. Following surgery, patients must undergo a lengthy rehabilitation program to restore the joint's strength and mobility, and they may have to

wear a knee brace. It may be six months to a year before they can return to their sport.

### *Prevention*

To prevent ACL injuries women should try to:

- ◆ land safely, on the ball of the foot, then rock back to the middle to gain balance;
- ◆ pivot in a crouched, rather than an upright, position;
- ◆ stop gently, using three little steps, rather than one big one; and
- ◆ do routine exercises to strengthen the legs and keep the knee joint flexible, such as leg presses and squats.

## SHOULDER AND ARM INJURIES

Shoulder and arm injuries are common in athletes of both sexes, and the proportions of men and women who sustain such injuries do not differ as much as do the proportions of athletes developing leg injuries. Rotator cuff tears are a common source of shoulder pain, especially in women over age 40. Such tears may be the result of a single, traumatic event, although they are more commonly associated simply with overuse over the years. At particular risk are women who participate in sports such as baseball, tennis, weight lifting, and rowing. Shoulder dislocation may occur when the shoulder is struck by a strong force that pulls the arm in an extreme direction, for example, during a fall or in sports.

## STRESS FRACTURE

A stress fracture, sometimes called a fatigue fracture, is a tiny crack or cracks in the surface of the bone. It is caused by repetitive stress, such as that associated with frequent bending. The most common sites for stress fractures are in the lower leg and foot. Stress fractures in one of the bones of the back, a condition called spondylosis, is a common cause of back pain in athletes. It occurs most often in sports that are dominated by females, such as dancing and figure skating, but it is also common among gymnasts. Females may be more at risk for a stress injury to the bone because of their hormones and anatomic and sex factors. Treatment options include bracing and surgery.

## FROZEN SHOULDER

Frozen shoulder is the common name for adhesive capsulitis, a condition characterized by shoulder pain and a gradually reduced range of motion.

Approximately 70 percent of patients with adhesive capsulitis are women, and 20–30 percent of those affected subsequently have adhesive capsulitis develop in the opposite shoulder as well. It is most common in people between ages 40 and 60. Risk factors include diabetes, thyroid disease, trauma, stroke, prolonged immobilization, and heart attack.

The cause of frozen shoulder is not known. It develops when an inflammation leads to a tightening of the space between the capsule and ball of the arm bone, where it fits into the shoulder joint. The disease has three stages: freezing, frozen, and thawing. The freezing stage lasts between 10 and 36 weeks and is characterized by the most severe pain. The frozen stage lasts between four and 12 months. Pain decreases gradually, but range of motion generally remains limited. The thawing phase is marked by a gradual return of motion and may last as little as 12 months or for years.

Treatment generally involves rest, use of anti-inflammatory agents such as ibuprofen to relieve pain, and gentle range-of-motion exercises. Corticosteroid injections or muscle relaxants may be prescribed for patients with severe pain. Surgery is recommended only if the condition does not resolve after several months.

#### CARPAL TUNNEL SYNDROME

The carpal tunnel is a narrow passageway of ligaments and bones at the base of the hand. Inside the carpal tunnel is the median nerve, which carries nerve impulses to the thumb and fingers. If the carpal tunnel becomes irritated, it may swell and press on the median nerve. The result may be pain, weakness, numbness, or a burning or tingling sensation in the hand and wrist, and these sensations may radiate up the arm. This condition is called carpal tunnel syndrome (CTS). The dominant hand usually develops the condition first.

##### *Why Your Sex Matters*

Women are three times as likely to develop CTS as are men. One reason may be that their carpal tunnels are narrower. Although young women are especially prone to CTS during pregnancy, the condition is generally more prevalent in middle-age and older women. People who engage in repetitive, assembly line-type tasks are more likely to develop CTS than are people who do not do such work. Heavy use of a computer keyboard does not necessarily increase a person's risk of CTS.

Treatment involves resting the affected hand and wrist for at least two weeks and using NSAIDs such as aspirin or ibuprofen. CTS surgery is recommended only if symptoms continue for at least six months.

There are no clear-cut rules for preventing CTS. Avoiding repetitive

stress, taking breaks, and making adjustments in the work environment may help.

#### FOOT PROBLEMS

Some foot problems affect women more than they do men; one reason is that narrow, high-heel shoes worn by some women can push together the toes and irritate the nerves of the feet.

Morton's neuroma is a thickening of the nerve between two toes. It is caused by repeated irritation, and usually only one foot is affected. The key symptom is pain in the ball of the foot that may radiate to the toes. The pain gets worse during physical activity and resolves when the shoes are removed or the foot is massaged. Customized shoe inserts may help relieve this problem.

A bunion is a bony knob that forms at the base of the big toe. It is far and away a woman's condition—only one patient in 10 is a man. A bunionette is a similar protrusion on the opposite side of the foot, near the base of the little toe. Although bunions tend to run in families, their main cause is tight shoes, particularly high heels that force the toes forward. Left untreated, the bunion may force the big toe inward, moving weight to the inner part of the foot and causing the arch to collapse. Arthritis of the toe may develop. Surgery is recommended if simpler measures, such as wearing appropriate shoes and using arch supports, are not effective.

## Musculoskeletal Health during Pregnancy

The changes in a woman's body that accompany pregnancy, coupled with the strain of carrying a growing fetus, put stress on a woman's musculoskeletal system. Back and wrist pain and leg cramps are among the most frequent complaints.

More than two of every three pregnant women complain of back pain at some point. Low back pain rates increase with advancing maternal age; such pain is also higher in women who have already given birth and in those who have had such back pain during previous pregnancies. As the uterus enlarges, it moves the body's center of gravity forward, causing an increase in the normal curve of the spine. This puts stress on the joints and ligaments of the lower back. In addition, hormones produced during pregnancy cause the pelvic ligaments to loosen and the joints to open. This, too, can cause pain. Back pain can be particularly severe if a woman gains more than the recommended amount of weight during pregnancy.

To avoid pain, women should avoid standing, wear comfortable

shoes, sit in chairs that provide firm support, and sleep on a firm mattress. Changing position often can also help, as can scheduled periods of rest, with the feet elevated to flex the hips and decrease spinal curving. Sitting pelvic-tilt exercises and aquatic exercises have been shown to decrease pain.

Wrist pain may occur because of swelling, leading to CTS. Another condition that may involve this area is de Quervain's tenosynovitis, an inflammation of the tendons of the back of the wrist. Leg cramps, particularly at night, are another common symptom during pregnancy. Such cramps may sometimes signal a calcium deficiency—a possibility of which your doctor should be aware.

### EXERCISE DURING PREGNANCY

Provided that appropriate precautions are taken, exercising during pregnancy has many health benefits for women. Those who engaged in regular exercise before becoming pregnant should continue to do so. For women who have not yet adopted a regular exercise routine, this may be an excellent time to begin. In addition to providing musculoskeletal benefits, regular exercise is beneficial for the cardiovascular system and helps prevent excessive weight gain. Both the mother and fetus benefit from exercise during pregnancy. Women who exercise regularly during pregnancy may have shorter labors and less need for surgical delivery. There is also evidence that beginning a moderate plan of weight-bearing exercise early in pregnancy can enhance fetal growth.

The American College of Obstetricians and Gynecologists (ACOG) recommends that all women of childbearing age exercise moderately for 30 minutes on most days. While recognizing the overall benefits of a well-planned exercise regime that is monitored by a physician, ACOG also cautions that vigorous exercise should be avoided, or at least strongly curtailed, in certain women. For example, women at high risk for preterm delivery or who have had second- or third-trimester bleeding should not engage in aerobic exercise, while women who are excessively obese, have poorly controlled hypertension, or are heavy smokers, among other factors, should engage in vigorous exercise only to a limited extent. Each pregnant woman's overall health, as well as each potential exercise activity, should be evaluated for its benefits and risks.

### GUIDELINES FOR EXERCISE DURING PREGNANCY

- ◆ Do not exercise on your back after the first trimester of pregnancy, and avoid prolonged periods of motionless standing.

- ◆ Stop if you become fatigued; do not exercise to exhaustion.
- ◆ As your pregnancy progresses, modify your exercise activity; for example, you may switch from weight-bearing exercise such as jogging to nonweight-bearing exercise such as using a stationary bicycle or swimming.
- ◆ Make sure you drink enough water and wear appropriate clothing so that you do not become too hot. Make sure that the room in which you exercise is an appropriate temperature and has adequate air circulation.
- ◆ Be aware of nutritional requirements. Pregnancy alone requires an extra 300 calories a day; additional caloric intake depends on the length and intensity of your exercise routine.

## Conclusion

A strong musculoskeletal system is key to a healthy, active life for all girls and women—for a toddler who has just learned to walk, the adolescent girl who is captain of her school soccer team, the 50-year-old grandmother who is nearing menopause, and the 85-year-old great-grandmother who wants to maintain her independence as long as she can.

Some aspects of musculoskeletal health depend on heredity and are beyond an individual woman's control. Moreover, innate differences in biology mean that a greater proportion of women than men develop some musculoskeletal disorders. Nonetheless, women can do many things to ensure optimal bone health; two of the most important are proper diet and exercise. Once a bone disease develops, a woman can, with the help of her primary care physician, orthopaedist, and other members of the health team, take steps to ease pain, prevent progression of disease, and maintain an active lifestyle.

Meanwhile, given the medical community's renewed commitment to research and the advent of new medications and diagnostic techniques, it is likely that today's toddlers and adolescents will find it far easier to maintain bone health throughout their lives.

—LAURA L. TOSI, MD

**Table 1. Bone Health: How Men and Women Differ**

A comprehensive, multinational report from the World Health Organization reveals the following:

**Osteoarthritis (OA)** is a loss of joint cartilage that leads to pain and loss of function. It can occur in any joint, but is most common in the hip. Worldwide, OA affects 9.6 percent of men and 18 percent of women over age 60. The incidence of OA is higher in women than in men at virtually every stage of life.

**Osteoporosis (OP)** is a disease characterized by low bone mass, deterioration of bone tissue, and increases in bone fragility and susceptibility to fracture. The general prevalence of OA at age 50 is 5 percent for women and 2.4 percent for men; by age 85, the percentages rise to 50 percent and 20 percent, respectively. Other estimates place the risk much higher: on the basis of WHO diagnostic criteria, 54 percent of postmenopausal white women in the northern parts of the United States have OP.

**Fragility fractures**, defined as fractures occurring in people age 40 and older that occur following low-energy trauma (for example, falling from a standing position) are a direct reflection of OP. More than half of women age 50 experience a fracture at some point in their lives—a far higher proportion than men. For example, in 1990, of the 1.66 million reported hip fractures worldwide, 1.19 million were in women and only 463,000 in men. The incidence of vertebra deformities among people between age 50 and 79 is 1 percent per year among women and 0.6 percent in men. Vertebral fractures often occur spontaneously, in the course of lifting or simply changing positions; only a third of these fractures are associated with a fall. Women have four times as many fractures of the forearm as do men, and women account for three-quarters of fractures of the upper arm.

**Lower-back pain** is the most common of all musculoskeletal conditions; at any given time, 4–33 percent of the population suffers from it. Back pain, unlike other most common musculoskeletal complaints, is slightly more common in men than it is in women, which may be due to its association with occupational factors such as heavy physical work and lifting.

*Table 2. The Bone Health Team*

Treatment of bone and muscle disorders is most successful when there is close cooperation among the doctor, patient, and family members. On that team are health care professionals who treat disorders relating to the musculoskeletal system. They include the following physicians and therapists:

**Orthopaedic Surgeon or Orthopaedist**—a physician with advanced surgical training who specializes in the diagnosis and treatment of musculoskeletal disorders

**Physiatrist**—a physician who specializes in the evaluation and treatment of musculoskeletal and neurological diseases and conditions to effect rehabilitation of neuromuscular functioning (also called a specialist in physical medicine and rehabilitation)

**Rheumatologist**—a physician who specializes in internal medicine and has advanced training in rheumatology, which involves diseases of the immune system and the musculoskeletal system, including the joints, muscles, and bones

**Physical Therapist**—a professional who helps patients return to normal musculoskeletal functioning following illness or injury

**Occupational Therapist**—a professional who helps patients achieve maximal independence in tasks of daily living after injury or illness

**Licensed Acupuncture Therapist**—an individual who reduces pain and improves functioning by inserting fine needles into the skin at various points in the body

Your primary care physician is part of your bone health team. Psychologists, social workers, dietitians, and nurse educators, as well as medical specialists such as neurologists and radiologists, may also be part of the team.