

## Fact Sheet

## Osteoarthritis

Osteoarthritis, the most common form of arthritis, affects nearly 21 million Americans. A degenerative disease, it is caused by a breakdown of cartilage, the hard but slippery tissue that covers the ends of bones where they form a joint. Healthy cartilage allows bones to glide over one another, and it absorbs energy from the shock of physical movement. In osteoarthritis, the surface layer of cartilage breaks down and wears away (Figure 1). This results in bones under the cartilage rubbing together, causing pain, swelling, and stiffness. Eventually, bone spurs develop, permanently changing the joint's shape.

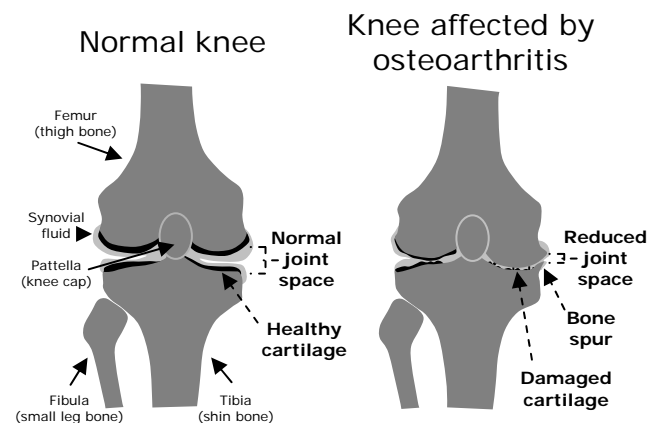
### Yesterday

Osteoarthritis was viewed as an inevitable consequence of aging or injury, about which little could be done.

- Patients were told to rest their joints by avoiding exercise.
- For pain relief, patients took aspirin or, beginning in the mid-1970s, nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen.
- Early artificial knees were constructed like hinges, and did not permit the natural rotation and bending of the knee, leading many early implants to loosen shortly after surgery.
- Patients between 60 and 75 years of age were considered to be the best candidates for total knee replacement surgery, as they were not expected to require a second implant.
- Although hip replacement surgeries were more successful than knee replacement surgeries, they were reserved only for the most seriously disabled patients. In 1982 approximately 75,000 total hip replacements were being performed annually in the United States.

- Certain genetic mutations also predispose individuals to develop osteoarthritis. For example, scientists identified a mutation that weakens collagen (a major component of cartilage) and causes it to break down or tear more easily under stress.

Figure 1: Drawing of normal and osteoarthritic knee joints illustrating cartilage deterioration and bone spurs associated with osteoarthritis.



### Today

Although osteoarthritis is common in Americans 65 years of age or older, osteoarthritis is known to be caused by more than age-associated “wear-and-tear” on the joints.

- Researchers now know that injuries to a joint— whether through sports, accidents, or even daily living—can lead to joint degeneration. Some former professional football and soccer players, for example, require knee and hip replacements in their early forties and fifties.

- An NIH-funded study recently demonstrated that smokers who have osteoarthritis have more severe joint pain and a greater degree of cartilage degradation than nonsmokers with osteoarthritis.
- Although people who are overweight are at an increased risk of developing osteoarthritis, the longstanding NIH-supported Framingham Study recently demonstrated that overweight people who walked or jogged regularly were no more or less likely to have osteoarthritic joint damage than their overweight, sedentary peers.

- Instead of rest, moderate exercise is suggested for patients as part of their therapy. Clinical trials supported by the NIH show that exercise reduces joint pain and stiffness, and increases flexibility, muscle strength, cardiac fitness, and endurance. It also is known to help with weight reduction and contributes to an improved sense of well-being. Patients who have moderate-to-severe knee pain that does not respond to medications can receive injections of hyaluronic acid, which lubricates the damaged joint and may slow progression of disease.
- Development of longer-lasting materials and design of artificial joints that more closely mimic the natural movement of the knee are making total knee replacements more popular and better suited for younger, more active patients who have osteoarthritis. In 2003, approximately 300,000 total knee replacement surgeries were performed in the United States.
- Surgical advances have made hip replacements safer for older patients, many of whom have other conditions that previously would have made them ineligible for the procedure. Of the approximately 254,000 hip replacement surgeries performed in the United States in 2000, almost half were in patients over 75 years of age.
- In the mid-1990s, NIH-funded investigators concluded that total hip replacement was a cost-effective treatment for patients who had limited mobility due to hip osteoarthritis. They estimated that, over a 20-year life expectancy of an artificial hip, the medical costs associated with a hip replacement were considerably less than the costs incurred had a patient opted for non-surgical treatment.
- The development of less-invasive surgical approaches and preoperative regimens has led to decreased recovery time. Recently, an NIH-funded study demonstrated that osteoarthritis patients who participated in an exercise program before receiving an artificial knee or hip were more likely to return home instead of going to an inpatient rehabilitation facility immediately after leaving the hospital, a finding that is likely to have profound cost-savings if widely adopted.

## Tomorrow

By 2030, an estimated 20 percent of Americans—about 70 million people—will have passed their 65th birthday and will be at increased risk for osteoarthritis. Over the next 2 decades, however, advances from NIH-funded research will enable many of these individuals to be spared the pain and disability that osteoarthritis causes today. Researchers are poised to develop new strategies to *predict* which patients are at risk of developing osteoarthritis, to *preempt* the joint degeneration that causes osteoarthritis symptoms, and to *personalize* joint-preserving interventions.

- *Predicting osteoarthritis.* In the near future, clinicians will be able to determine which of their young patients with injured ligaments and tendons are predisposed to developing osteoarthritis later in life, allowing early interventions to prevent or slow down degenerative joint disease.
- *Preemptive approaches.* One of the barriers to the development of drugs that block joint degradation is the lack of objective and measurable standards for disease progression by which new drugs can be evaluated. To overcome this problem, the NIH—with input from the U.S. Food and Drug Administration—has partnered with private sponsors to create the Osteoarthritis Initiative, featuring a publicly available research resource that investigators can use to identify and evaluate osteoarthritis biomarkers. In this case, a biomarker would be a physical sign or biological substance that could be used in clinical studies to monitor changes in joint health.
- *Personalized treatments.* NIH-supported researchers are testing approaches for engineering healthy pieces of cartilage that would replace damaged tissue following injury before joint damage occurs. Because the replacement tissue would be grown from cells taken directly from the patient, the new cartilage could be transplanted back into the patient without any risk of rejection.

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