

OSTEONECROSIS AND HIV DISEASE

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Clinicians are increasingly aware of bone disease in people with HIV infection. As reported in the Summer/Autumn 2001 issue of *BETA*, bone mineral deficiencies (osteopenia and osteoporosis) are being seen in a growing number of HIV positive men, women, and children. At the same time, unusually high rates of osteonecrosis (bone death) in adults and children with HIV have been detected in recent studies

Osteonecrosis is a relatively rare but pernicious condition characterized by severe joint pain and progressive loss of mobility. Its unexpected appearance in people with HIV warrants an examination of probable causes and a look at current treatments.

The Bone-Blood Connection

As living tissues, bones throughout the body require an uninterrupted blood supply. Lack of blood results in death of osteoblasts (bone-forming cells) and eventually in death of the affected bone tissue, or osteonecrosis. Avascular necrosis or AVN (tissue death due to an absent or diminished blood supply) is a term often used interchangeably with osteonecrosis, although AVN can apply to any body tissue. In this article AVN refers only to osteonecrosis.

AVN affects subchondral bone, which lies directly underneath articular bone surfaces (i.e., at joints, where two or more bones meet). The vascular (blood vessel) configuration of subchondral bone—characterized by sluggish blood flow through a circuitous route—increases the likelihood of vascular compromise in these areas. AVN most often occurs at the head of the thighbone, or femur, which is the knob-like section that connects to the hipbone (see illustration on this page). Unlike most other bone regions, the anterior femoral head (adjoining the inner side of the hipbone) is supplied with blood through only one channel; an obstruction to this single vascular branch tends to result in bone death. AVN also occurs in the head of the upper arm bone (humerus), which connects to the shoulder blade (scapula); the lower end of the femur at the knee; and less frequently in the bones of the hands and feet.

Postmortem Bone Collapse

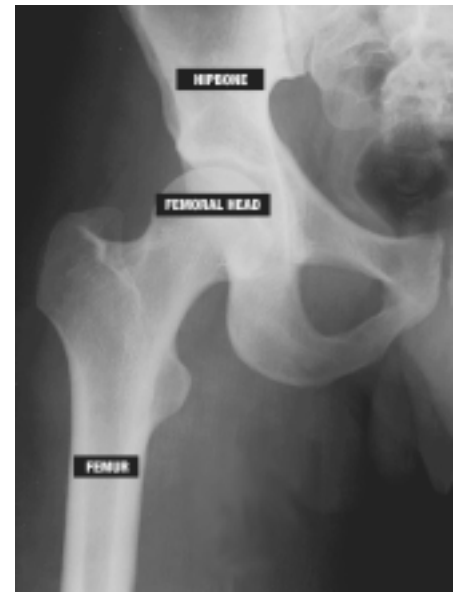
Death of subchondral bone itself does not cause the debilitating effects of AVN; these arise from deficiencies in the body's mechanisms for repairing dead (necrotic) bone tissue, a process known as bone turnover or remodeling. Throughout the life of an individual, the bones of the skeleton are continuously broken down, or resorbed, by osteoclast cells (a type of bone cell) and rebuilt by osteoblast cells. This remodeling process allows minerals stored in the bone to be released into the body as needed while

the strength of the skeleton is maintained. Irregularities in the remodeling process pose a variety of risks to bone health. For example, imbalances in bone resorption and formation contribute to low bone mineral density and brittle bones characteristic of osteopenia and osteoporosis (see "Osteoporosis and HIV Disease" on pages 26–34 of the Summer/Autumn 2001 issue of *BETA*).

In some people with AVN (e.g., young people with AVN caused by trauma) the affected bone may heal spontaneously. In many cases of AVN, however, bone turnover imbalances prevent adequate healing at sites of dead subchondral bone. Resorption of necrotic bone tissue outpaces the production of new bone, which must ossify, or harden, over time. The resulting weakened and unevenly repaired areas of subchondral bone may collapse (due to microfractures) from the normal pressure placed on joints, particularly at the hip (femoral head). With their underlying structural support destabilized, the articular surfaces of the joints degenerate, become deformed, and cause arthritis (joint inflammation), progressively intensifying pain, and, eventually, incapacitation. People with AVN of the hip are likely to lose their ability to walk if they do not receive treatment.

Causes of Osteonecrosis

Blood supply to subchondral bone is inhibited by either direct or indirect causes. Trauma to bones and joints, such as a fracture or dislocation, can result in direct damage to or obstruction of blood vessels. Certain diseases and disorders may cause AVN by inhibiting blood supply to the bone over time. Many of these conditions adversely affect the ability of blood to flow properly by allowing lipids (fats) to accumulate in vessels, by causing the blood to become more viscous ("sticky" and likely to form clots), or by damaging the blood vessel network. For example, the abnormal crescent shape of red blood cells and increased viscosity of blood in people with sickle-cell disease—the most common cause of AVN worldwide—can lead to an interrupted blood supply within subchondral bone.



Other conditions associated with AVN include Gaucher's disease (abnormal blood fat metabolism), Cushing's syndrome (excess cortisol, an adrenal gland hormone, in the blood), hyperlipidemia (high blood fat levels), atherosclerosis (thickening and hardening of the arteries), infections involving joints, diabetes mellitus (abnormal carbohydrate metabolism), systemic lupus erythematosus (an autoimmune disease characterized by inflammation of the connective tissue, especially in the joints), pancreatitis (inflammation of the pancreas), and decompression sickness (formation of nitrogen bubbles in the blood and tissues following a rapid drop of surrounding pressure, as experienced by deep sea divers).

Risk factors for osteonecrosis also include the chronic use of certain drugs, such as corticosteroids, and other substances. Corticosteroids are steroids produced by the adrenal glands. Steroids are a family of organic compounds that share a similar chemical structure, and include certain hormones (such as testosterone) and various drugs. Synthetic corticosteroids are used widely in medicine, especially as anti-inflammatory agents to treat illnesses such as rheumatoid arthritis and systemic lupus erythematosus. Glucocorticoids, such as prednisone and hydrocortisone, are a subset of corticosteroids. The adverse effects of corticosteroids on subchondral

bone may be two-fold: these agents are believed to cause fat deposits in the capillaries of subchondral bone and to cause constriction of these small vessels as a result of increased internal bone pressure. (The increased pressure is presumably a result of the increased size of bone marrow lipocytes, or fat cells, caused by corticosteroids.) Gaucher's disease and other factors may also increase internal bone pressure and adversely affect small blood vessels. Chronic alcohol use is thought to trigger a similar set of adverse events. Smoking is another known risk factor for osteonecrosis; in this case, the disruptive mechanism is likely to be vascular spasms, or sudden, brief constrictions of blood vessels.

Much remains unknown regarding various conditions and agents associated with osteonecrosis and their mechanisms of decreasing blood flow to subchondral bone. Furthermore, approximately 10–20% of AVN cases in the general population are known as idiopathic AVN, or AVN of unknown origin; risk factors associated with these cases have not been clearly established.

A Complication of HIV?

According to the National Institutes of Health (NIH), roughly 10,000 to 20,000 new cases of osteonecrosis are reported in the general U.S. population each year. Unlike osteoporosis, AVN is not associated with older age or female sex: most cases occur in men and women between 30 and 50 years of age. Estimates of the prevalence of AVN in the general population range from approximately 0.02% to 0.14%.

Osteonecrosis is also uncommon among people with HIV as a group. Nevertheless, recent data indicate that the condition may be more prevalent in HIV positive people than in the general population. In a study published in the July 2001 issue of *AIDS Patient Care and STDs*, Leonardo Calza, MD, of the University of Bologna, Italy, and colleagues estimated that 0.4% of people infected with HIV—especially those with advanced HIV disease—develop osteonecrosis, based on a review of the medical literature from 1990 to 2000. Furthermore, the incidence (number of new

cases) of osteonecrosis appears to be rising, notably since the introduction of highly active antiretroviral therapy (HAART) in 1996.

To date, the apparent increase in AVN incidence cannot be linked with certainty to any particular condition or medication associated with HIV disease. As with many metabolic complications found in HIV positive people, the rise may be partly attributable to HIV disease itself. As people who take HAART live longer, the natural history of HIV disease may somehow predispose people with HIV to osteonecrosis, perhaps as a result of immune dysfunction (or, conversely, of HAART-related immune reconstitution). Increased screening for AVN due to heightened awareness of the condition likely plays a role in the upswing as well. Nevertheless, recent studies point to factors or patterns that may increase the likelihood of osteonecrosis in HIV positive people and lead to better prevention and treatment strategies.

HAART: An Unknown Risk

An association between HIV and osteonecrosis has been made only in the past few years. Many people therefore have suggested that anti-HIV drugs—especially protease inhibitors (PIs), which have come to be widely used during this time—are to blame. PIs in particular seem likely culprits because they cause hyperlipidemia, a known risk factor for osteonecrosis. Yet no studies to date have borne out this hypothesis. It is important to remember that almost all studies conducted thus far have been very small, lacking in data on metabolic markers such as triglyceride levels, and almost never prospective, that is, following subjects forward over time.

A retrospective, case-controlled chart review of 25 HIV positive people diagnosed with AVN between 1984 and 1998 in Dallas (the “Dallas cohort”), was published by Anita N. Scribner, MD, and colleagues in the September 2000 issue of the *Journal of Acquired Immune Deficiency Syndromes (JAIDS)*. Two HIV positive control subjects without AVN

(50 total, 16% female) were matched to every subject with AVN (25 total, 100% male) to evaluate potential risk factors. Only two of the subjects with AVN were diagnosed before 1996 (i.e., before the introduction of HAART).

Dr. Scribner's team found that PI use among people with AVN (79%) and without AVN (76%) was nearly identical, and that PI drugs as a class were not independently associated with osteonecrosis. However, their analysis did show that saquinavir (Fortovase) alone among PI drugs was significantly associated with AVN, although the authors did not know of any data indicating that saquinavir would be more likely than other PIs to cause adverse metabolic effects. They suggested that the small number of study subjects may have contributed to this inexplicable outcome.

Alternatively, the fact that saquinavir (in the Invirase formulation) was the first PI to be approved, and was likely taken soon after approval by those already experiencing significant immune system damage, might explain the result. This scenario would undermine the theory of a HAART-related AVN effect in favor of the theory that HIV disease itself contributes to AVN. Another limiting factor of Dr. Scribner's study was that complete antiretroviral medication records were available for only 24 of 25 subjects with AVN and 41 of 50 of those without AVN. In addition, length of time on therapy among AVN cases and controls was not noted in this study.

A similar case-controlled, retrospective study was reported by Marshall Glesby, MD, PhD, from Weill Medical College of Cornell University in New York City and colleagues in the August 15, 2001 issue of *The Journal of Infectious Diseases*. Dr. Glesby's team found that PI therapy was not significantly associated with osteonecrosis among 17 subjects with AVN of the hip and 34 matched controls without AVN. Differences in duration of antiretroviral therapy between the two groups also were not statistically significant.

Studies that appear to suggest a relationship between PIs and AVN often are difficult to evaluate because of their



When the researchers performed MRI scans, 15 (4.4%) of those with HIV had AVN-related bone lesions in at least one hip—to the surprise of everyone involved. Significantly, none of those with AVN reported any symptoms.

particularly weak study designs. For example, Dr. G. Sirera and colleagues described a cohort of 11 HIV positive people (eight males, three females) with osteonecrosis at the 40th Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC) in September 2000. While nine of the 11 had taken PI-based HAART (for a mean of 19.4 months), no controls were used in the study, so it is impossible to assess if and how PI use impacted the development of AVN. (It is interesting to note, however, that nine of the 11 had bilateral AVN, i.e., in both hips, which in several studies appears to be more common than unilateral disease.)

The fact that roughly 30–40 cases of AVN in HIV positive people were reported in the literature prior to the use of combination anti-HIV drug regimens also may undermine the proposed association between HAART and AVN. In a number of these AVN cases, including three reported by Dr. Calza's group, the individuals had never taken anti-retroviral medication. While it is likely that some of these people had known risk factors predisposing them to osteonecrosis

(such as alcohol abuse), there is still no answer to the question of why the condition has appeared more frequently only in the past few years. Higher rates of HIV disease mortality earlier in the epidemic (that is, before HAART) could be one explanation, as those with HIV would have been less likely to survive long enough to develop symptomatic AVN.

Nevertheless, the secondary effects of anti-HIV drugs—in particular the effect of PI drugs on lipid levels—remains an intriguing issue in the study of AVN. In November 2001 the U.S. Food and Drug Administration (FDA) and the Veterans' Administration (VA) announced a joint retrospective study of approximately 50,000 HIV positive people to assess whether anti-HIV drugs contribute to AVN. Large prospective studies have yet to be conducted.

Risk Factor Trends

In her September 2000 *JAIDS* report, Dr. Scribner speculated that “although others have suggested that HIV infection itself is an independent risk factor for osteonecrosis, an alternative explanation is that certain osteonecrosis risk factors are more prevalent in HIV-infected [persons].” Several studies do show that an array of risk factors previously associated with AVN tends to cluster in some HIV positive people with the condition. Some researchers therefore have reached the preliminary conclusion that the pathogenesis (origin and development) of AVN in people with HIV disease is multifactorial and not primarily a result of one factor, such as the use of certain anti-HIV drugs. It also may be true that HIV disease itself plays a secondary role in those with known risk factors.

In the study of the Dallas cohort by Dr. Scribner's team, risk factors in those with AVN were hyperlipidemia (eight cases, or 32%); alcoholism (seven cases, or 28%); hypercoagulability, or increased viscosity of blood (three cases, or 12%); and corticosteroid use (three cases, or 12%). As mentioned previously, hyperlipidemia has become increasingly prevalent among HIV positive people taking PIs, and a number of researchers have indicated that heavy alcohol use

is not uncommon in their cohorts of HIV positive people. Those with HIV may be more likely than HIV negative people to have hypercoagulable blood because of elevated antiphospholipid (notably anticardiolipin) antibodies, which are known to increase the risk for thrombosis (blood clots). These antibodies are not routinely monitored in studies of AVN, although future study protocols may require this type of evaluation. One person in the Dallas cohort was tested and found to have increased levels of these antibodies. He was one of three AVN cases with a history of deep vein thrombosis; the other two cases were not analyzed for predisposing factors.

According to the NIH, long-term corticosteroid use appears to be associated with approximately 35% of nontraumatic AVN cases in the general population. The NIH further states that “there is no known risk of avascular necrosis associated with the limited use of steroids,” although a few case reports in the medical literature implicate short-term (under 30 days') use. People with HIV are prescribed corticosteroids for a variety of conditions, particularly as a short-course treatment for *Pneumocystis carinii* pneumonia (PCP), a life-threatening opportunistic illness (OI) in people with HIV. Currently there are no recommendations for people who require corticosteroid drugs for PCP to avoid taking them. People with PCP should keep in mind that the risk of succumbing to the OI may be far greater than the potential risks of developing either osteonecrosis or osteoporosis (see below). As always, starting or stopping any drug should be discussed with a physician.

Corticosteroid—especially glucocorticoid—use is also a known risk factor for osteoporosis, increasing the likelihood that HIV positive people with AVN who have taken these drugs also could develop bone mineral deficiencies, and vice versa. The coexistence of these two bone conditions is not unknown; for example, Dr. Scribner's team reported “severe osteopenia” in one person with osteonecrosis. However, evidence to date does not suggest a causal relationship between the two diseases.

It should be noted that four people with AVN (16%) in the Dallas cohort (but none of those without AVN) had taken megestrol acetate (Megace), a synthetic progesterone used to stimulate appetite and promote weight gain in people with HIV-related wasting syndrome. Megestrol acetate has been reported to have corticosteroid-like activity. Dr. Scribner's team proposed that megestrol acetate may prove to be a newly identified risk factor for osteonecrosis—a theory that echoes a report by Cynthia Gibert, MD, of the Veterans Affairs Medical Center in Washington, DC, and colleagues given at the 5th Conference on Retroviruses and Opportunistic Infections (CROI) in February 1998.

In reviewing adverse reactions to megestrol acetate reported to the FDA, Dr. Gibert's team found three cases of AVN of the femoral head in people with AIDS who took the drug for wasting. All were male (aged 34, 36, and 55 years) and had taken the drug for six to 18 months for wasting; two had no prior

history of corticosteroid use. (Remarkably, none of the many women who took megestrol acetate for breast cancer or other malignancies reported osteonecrosis.) Additionally, megestrol acetate is believed to have induced Cushing's syndrome (a known AVN risk factor) in people with AIDS, according to several studies published in the past decade. (People with Cushing's syndrome often develop a fat pad, or "buffalo hump," on the upper back; these fat accumulations are not associated with similar body shape changes recently seen in people with so-called lipodystrophy syndrome.) Researchers recommend further investigation of a possible link between AVN and megestrol acetate.

Interestingly, Dr. Scribner's team found that none of the different risk factors analyzed in their study were significantly more prevalent in those with AVN compared with HIV positive controls without AVN. For example, while eight subjects with AVN (32%) had hyperlipidemia, 12 control subjects

(24%) had hyperlipidemia but no evidence of osteonecrosis. A plausible explanation is that the different risk factors play a role in the development of AVN only in those people who are predisposed to the disease due to another, unknown factor. If the unknown risk factor is HIV disease itself, further study will be needed to determine what particular aspect(s) of HIV infection influence the death of bone. Some researchers have started looking for such clues. Dr. Scribner's team noted, for instance, that there were no significant differences in CD4 cell levels between those with and without AVN.

More studies are needed to detect associations between AVN, CD4 cell and viral load levels. One literature review (encompassing 1990–1999) by researchers at Wayne State University in Detroit detected no significant differences in CD4 cell levels and viral load in those diagnosed with osteonecrosis. However, Dr. Glesby's team found that those people whose CD4 cell levels increased

RISK IN CHILDREN

As with osteoporosis, evidence of osteonecrosis in HIV positive children is alarming, as higher rates of bone growth in children can magnify any imbalance or disorder of bone turnover. Osteonecrosis of the hip in children is known as Legg-Calvé-Perthes disease (LCPD) or simply Perthes disease; in the general population, it mainly occurs in males aged 3–12 years. One of the few reports focusing on AVN in HIV positive children to date was presented by D.M. Gaughan of the Harvard School of Public Health and colleagues at the 8th CROI in February 2001. Two cases of LCPD (one male, one female) were reported at study entry and three subsequent cases (two male, one female) were reported during follow-up among a cohort of 1,011 HIV positive children monitored from January 1, 1996, through 2000 as part of the PACTG 219 study. This represents an incidence rate of 0.94 per 1,000 person-years, significantly higher than the rate of 0.06 per 1,000 person-years in the general population. (A person-year is a shorthand term used by epidemiologists to make comparisons; its value is determined by multiplying the number of persons by the number of years.) Causes of LCPD could not be identified in this cohort. However, the researchers did note that while all of the children had been exposed to PI drug therapy by 1999, two of the three children who developed LCPD were not taking PIs at the time of their diagnosis.

at least 50 cells/mm³ above their nadir, or lowest level, were five times more likely to develop osteonecrosis than those with less robust CD4 cell increases. The CD4 cell nadirs of people with AVN furthermore tended to be lower than the nadirs of those without AVN. According to these researchers, AVN therefore appeared to occur “primarily in [people] with severe immunosuppression who responded successfully to antiretroviral therapy, most of whom had other established risk factors for the disorder.”

Dr. Glesby’s team indeed found that 11 of 14 people with AVN had at least one classical, or traditional, risk factor—principally corticosteroid use—compared with 17 of 28 controls. (Risk also was associated with a history of PCP, although this was likely due to corticosteroid therapy.) Statistical analysis of the Dallas cohort also showed that risk factors overall were significantly more prevalent in those with osteonecrosis: 22 of 25 subjects with AVN (88%) had at least one classical risk factor (but no more than two) for osteonecrosis, compared with only 24 of 50 subjects without AVN (48%); three of the cases (12%) were idiopathic. The 11-person cohort analyzed by Dr. Sirera’s team similarly exhibited known risk factors for AVN. These included corticosteroid use in six (54%), hyperlipidemia in two (18%), and infection involving the joint in two (18%).

In addition, Henry Masur, MD, and other researchers from the NIH found a 4.4% rate of new osteonecrosis cases among 339 HIV positive subjects (and no cases among 118 HIV negative controls) using magnetic resonance imaging (MRI) of the femoral head. Statistically significant risk factors among people with AVN in this study included corticosteroid use and use of lipid-lowering agents (which may have been a surrogate marker for high lipid levels).

Again, larger epidemiological studies in HIV positive people likely will shed more light on the apparent AVN risk factors found in this population, and perhaps answer the question of why people with HIV only recently seem to have become prone to osteonecrosis.

Diagnosis

Because of the lack of effective, noninvasive treatment options at later stages of disease, early diagnosis of AVN is vital. Unfortunately, people with the earliest stages of osteonecrosis—before the collapse of subchondral bone—may not have noticeable symptoms, or even realize that they are at risk. The insidious nature of this disease was evident when Dr. Masur and his NIH colleagues discovered in the spring of 1999 that osteonecrosis may be a complication of HIV disease after they had diagnosed two HIV positive men with AVN of the hip. As mentioned previously, when the researchers performed MRI scans on HIV positive and HIV negative subjects, 15 (4.4%) of those with HIV had AVN-related bone lesions in at least one hip—to the surprise of everyone involved. Significantly, none of those with AVN reported any symptoms.

Since pain and reduced range of motion are not always hallmarks of early AVN disease, vigilance remains the best course of action. Physicians should exercise heightened suspicion regarding the likelihood of AVN in any of their HIV positive patients with known risk factors for the condition (see sidebar on page 28) or signs of pain or stiffness. AVN-associated pain often develops gradually and typically presents as a deep, throbbing pain that early on may be felt only when stress or weight is put on the affected joint. Pain in the hip area or groin may radiate down to the knee. Stiffness or limited range of motion may be noticeable only at certain times, for example, after sleeping. Later, severe pain may be felt even while at rest. As pain increases, the joint’s range of motion is further compromised.

Asymptomatic people suspected of having AVN should be diagnosed with an MRI scan, a highly sensitive technique for obtaining clear images of joints and other areas of the body such as the brain and spinal cord. MRI scans are the most useful means of detecting AVN in its early stages; they can provide images of diseased bone and information about bone turnover at the affected areas, and also detect chemical changes in bone marrow that signal

inadequate blood flow to the bone.

Standard radiographs (x-rays) are not recommended for diagnosing early AVN. X-rays are less sensitive than MRI scans, and are likely to show bone in the early stages of AVN disease as normal. However, x-rays during later stages of osteonecrosis can detect damaged bone, and are useful in monitoring the progression of disease and evaluating treatment options.

Other diagnostic techniques are used less often. Computed tomography (CT) scans offer both three-dimensional and cross-sectional (“sliced”) images of bone, and can help establish the extent of bone damage. Their usefulness in diagnosing AVN remains debatable. Bone scans (bone scintigraphy) involve photographing bones that have been injected with a nontoxic radioactive dye. As with x-rays, the resulting two-dimensional images are unlikely to identify early-stage AVN.

Surgical procedures can provide conclusive evidence of osteonecrosis, even when imaging techniques—including MRI—show normal results. A functional evaluation of bone measures inner bone pressure, and a bone biopsy involves removing bone tissue for laboratory analysis. Because these two techniques require surgery, they are performed only in unusual circumstances.

Whatever method of diagnosis is used, physicians should evaluate joints on both sides of the body (for example, left and right hip joints), as a significant percentage of AVN cases involve bilateral disease. AVN also may be present in different bone regions at the same time or at different times.

Treatment

If osteonecrosis is diagnosed at an early stage, a physician may be able (at least temporarily) to prevent the collapse of bone and subsequent joint degeneration. To accomplish this, the underlying cause or causes of disease must be identified and addressed. Treating a metabolic condition such as sickle-cell disease may be required, and agents known to cause AVN, such as corticosteroids or alcohol, may be stopped or severely restricted. However, such interventions

OSTEONECROSIS AND PEOPLE WITH HIV:

Risk Factors

- corticosteroid use
- hyperlipidemia
- hypercoaguability
- alcoholism
- tobacco smoking
- megestrol acetate (Megace)*

* possible, though unproven, risk factor

A detailed list of conditions with definite and possible associations with AVN can be found in the *Merck Manual* at www.merck.com/pubs/mmanual/tables/53tb1.htm.

may prove tricky if future research shows that both HIV disease itself and certain anti-HIV drugs contribute to osteonecrosis.

Even if addressing underlying causes is not possible, as in the case of idiopathic AVN, disease progression may be slowed by using physical therapy to maintain an optimal range of motion while reducing the force exerted on the affected joint(s). In the hip area, this entails minimizing weight-bearing activities such as walking (crutches may be prescribed). In the case of arms and hands, carrying and lifting should be curtailed as much as possible. (People with osteoporosis, in contrast, are advised to increase weight-bearing activities. Those with both osteoporosis and osteonecrosis should discuss the risks and benefits of any activity modification with their health-care provider.) In addition, electrical stimulation has been used in experimental settings to stimulate growth of bone.

People with symptomatic AVN will likely benefit from analgesic (pain-reducing) medication—preferably non-steroidal anti-inflammatory drugs, or

NSAIDs, such as ibuprofen (e.g., Motrin, Advil)—to improve their quality of life. If disease has progressed beyond the point of bone collapse, aggressive treatment interventions will be necessary. (Some such interventions also aid people with earlier stages of AVN.) All involve surgery and require the expertise of an orthopedic surgeon.

Arthroplasty means surgical repair of a joint. Hip arthroplasty entails the replacement of a damaged femoral head with a prosthetic (artificial) substitute, usually made of metal; at the same time, a prosthetic cup, or socket, made of plastic is secured to the joint. This technique of total hip replacement (THR) is the preferred method of reducing pain and restoring joint function for people with late-stage AVN. With appropriate physical therapy following surgery, many people who have undergone THR become fully functional and report little discomfort within a year. The joint implant may need to be replaced within 15 years due to wear.

Core decompression involves the removal of the inner bone layer, thereby reducing internal bone pressure and

pain, and allowing vascular growth and increased blood flow to the affected bone. This technique may help prevent bone collapse and joint damage. Joints can be further protected after decompression surgery by bone grafts (also called vascular grafts). Bone grafts are a complicated, experimental procedure that involves the transplantation of healthy bone tissue as well as an artery and veins to the diseased site. Recovery may take up to 12 months.

Osteotomy (literally, the cutting of bone) is a technique of reducing load-bearing stress on a damaged joint by cutting and realigning diseased bone. It requires a long recovery period (up to 12 months) and tends to have unpredictable results. Arthrodesis, or joint fusion, is a surgical means of immobilizing a joint that was more common before the era of hip and knee replacements and is no longer recommended for people with AVN.

Vigilance and Risk Reduction

The optimal approach to osteonecrosis can be summarized in a few words: prevention is key; early detection is next best; treatment for symptoms is the last resort. Future research on osteonecrosis ideally will lead to better methods of detection and prevention, more effective nonsurgical interventions, and enhanced durability of prosthetic joints. Until then, most people with AVN ultimately will require surgery to repair damaged joints, as conservative interventions to date, such as reducing weight-bearing activities, are likely to be only short-term solutions. The time from development of disease to severe pain and limited range of motion may be as brief as several months, especially if AVN is left untreated.

Since the best prevention methods are not yet known, a vigilant physician familiar with bone disease is a necessity. For people with HIV infection, this appears to be increasingly true.

While experts currently are not recommending that everyone with HIV be tested for osteonecrosis, people with at least one known risk factor for the

condition should be alert to symptoms such as pain in the groin area, discuss diagnostic testing with a health-care provider, and be willing to make changes in lifestyle or drug regimens. People with HIV in general may want to consider reducing their risk for osteonecrosis by limiting their alcohol intake, avoiding tobacco, treating raised lipid levels, and evaluating their use of corticosteroids.

This report is Part II in a two-part series of articles related to bone disease. Part I focused on osteoporosis in HIV positive persons and appeared in the Summer/Autumn 2001 issue of BETA.

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Toll-Free in Northern California:

800-367-AIDS

The California AIDS Hotline peer counselors provide support and confidential, comprehensive information about transmission, test sites, prevention, and treatment in English, Spanish, and Filipino dialects. A TDD line is also available for the hearing-impaired. The Hotline operates from 9:00 am to 9:00 pm Monday through Friday and from 10:00 am to 6:00 pm Saturday and Sunday.

In California, call toll-free

800-367-2437;

in San Francisco or out of state, call

415-863-2437.

The TDD line in California is

888-225-2437.