ANTI-INFLAMMATORY RADIATION

By: Gil Lederman, M.D.

Recently an international meeting was held in Brussels outlining potential benefits of radiation for benign diseases. Over decades in countries outside of the United States patients have had the opportunity of low dose radiation for treatment of inflammatory joint diseases and other benign conditions. Clinical practice is more limited in the United States.

Radiation is used for many reasons - cancerous and not! In general, Americans have been reluctant to use radiation for benign disease. That is changing rapidly. There are benign tumors accepted even in the United States for treatment. These include such tumors as meningiomas and acoustic neuromas. Our group is especially familiar with treatment of these tumors, having the largest experience worldwide for fractionated radiosurgery of acoustic neuromas. The appeal is better outcome compared to open surgery or even single fraction radiosurgery.

Radiation is used to treat hip joints that are prone to ossify or become fixed in place after hip surgery. This is in relatively standard use here. It is well known that radiation within hours of surgery for hip replacement can help prevent this deforming and even crippling unwanted calcification in the joint area. Also, radiation is suggested after traumatic hip fractures and replacements. The benefits are similar - prevention of an immobile joint.

Current studies, as well, are evaluating the use of radiation after angioplasty or balloon enlargement of blood vessels both in the heart and in peripheral vessels in an attempt prevent repeat stenosis or narrowing therefore inhibiting blood flow. This indication, radiation for atherosclerotic coronary disease may have the greatest implications since heart and vascular disease is America's leading cause of death.

While these studies are ongoing in the United States there are many other indications where radiation is being used elsewhere in the world. These are minimally benefiting Americans if at all. Those excluded in this country have such diseases as arthritis and tendinitis including golfer and tennis elbow.

A current paper published by Trott et al in the prestigious Radiotherapy and Oncology Journal outlined mechanisms of action using radiation for this purpose.

Radiation is used to prevent keloid reformation, Dupuytren's contracture (Ronald Reagan had surgery for this before the end of his presidency) and Graves disease, which leads to protruded eyes in patients with thyroid disease. President George Bush's wife, Barbara, underwent radiation for her Graves disease while in the White House. Keloids are over-growths of wounds usually after surgery or trauma. Dupuytren's contractures are thickening of tendons in the hand leading to deformities and immobility of the hand and fingers.

There are always risks involved with radiation. Risks could include, but are not limited to, potential late effects, even the induction of other tumors as well as changes in normal tissues.

It is for this reason that many are reluctant to administer radiation without clear indications. All patients who receive radiation go through an intense informed consent process explaining all risks, benefits and alternatives. This is equally important when non-malignant conditions are treated.

Recently were reported three randomized double blind studies using radiation for patients with painful degenerative joint disease. Patients did not know whether they were receiving placebo or radiation since a filter was placed in the machine, which in half of the patients blocked the rays.
All three studies showed improvement in symptoms within months, whether radiated or placebo treated. This suggests that some with acute diseases improve spontaneously. In Europe radiation is not usually given early but is reserved for those with chronic debilitating diseases unrelieved by other methods of treatment.

In animal studies radiation was given after injury to the joint cartilage. Treatment did not improve the architecture of the joint, yet it decreased painful symptoms. Pathologic evaluation weeks later showed disappearance of edema in the joint space. A similar study in the knees of rabbits showed diminished inflammation and joint swelling. The authors postulated “some therapeutic effects of radiotherapy for benign diseases are due to the ability of radiation to inhibit cell proliferation. Sometimes inflammatory cells affect the joint space. This may have long-term consequences if it exists during critical periods. This may explain the effectiveness of radiotherapy in prevention of heterotopic ossification.”

Radiation may also promote differentiation of cells. The last development of cells may well be important in diseases such as heterotopic ossification. There exists excessive calcium deposition in the joint space similar to keloids after surgery where the healing process does not seem to know when to stop. The patient is left with a joint that cannot move properly or fully. This causes dysfunction or immobility of the patient.

It was noted that “the effects of very low radiation doses of less than 500 rads on acute necrotizing formations are most spectacular. Mitigation of pain, edema and erythema occurs so fast and after such low doses that it is inconceivable that cell death or inhibition of proliferation could play any role in this process. The optimal therapeutic effects of low dose irradiation occur in the very early stages of inflammation when vascular dilatation, edema formation and leukocyte invasion are beginning.”

“Abscess formation which is the normal outcome of this process and which is due to release of proteolytic enzymes from the invaded, stimulated leukocytes does not occur after irradiation, yet bacterial infection is combated successfully. This suggests that abscess formation is not needed for the success of the inflammatory process but that the abscess is an excessive local response to local infection with staphylococci and other bacteria. Irradiation appears to prevent the successive response without impairing the bactericidal activity of invading leukocytes.”

Certainly, radiation is not used for infections or abscess formation in this country yet the authors proposed determining optimal radiation doses for a variety of inflammatory processes such as abscesses and furuncles.

Outside of America osteoarthritis and periarthritis are commonly treated benign diseases with radiation. In this country it is essentially unheard of. A recent German study showed that between 1994 and 1996 more than 12,000 patients per year were treated with radiation for anti-inflammatory purposes of osteoarthritis and insertion tendinitis in that one country alone.

Osteoarthritis is due to degeneration of the cartilage with a joint space. It is often felt that it is due to the aging process. Radiation has no effect on the degeneration of the cartilage yet there is an associated inflammatory process. The authors note that the inflammatory process increases the decay of cartilage.

Periarthritis is a degeneration of the soft tissues around the joint. Researchers note the effectiveness of low dose radiation is "astonishing." Furthermore, is "long lasting analgesic effects of radiotherapy of insertion tendinitis."

It was noted, however, radiation does not appear beneficial for a particular form of arthritis known as rheumatoid which is an auto-immune disease.

There certainly can be adverse effects from radiation, yet in a seminar held in San Antonio for
doctors worldwide, it was noted that more than 16,000 Americans die annually of adverse effects of simple non-steroidal anti-inflammatory pills that are available in the pharmacy or grocery store without a prescription. This is in far excess of what is seen in any form of radiation.

An endocrinologic disease that is, Graves disease, which affects the eyes, has been treated worldwide for many years with radiation. As noted above, Barbara Bush underwent radiation treatment while in the White House. It is speculated that the benefit of radiation is that it interferes with the local auto-immune process."

Authors suggested that, "better knowledge about the lowest effected doses would also permit a much more stringent discussion if possible on radiobiologic mechanisms."

Not surprisingly the paper concluded suggesting "randomized studies to compare a proven optimal radiotherapy protocol with the best non-radiation treatment are not justified before this optimization has been achieved."

Thus, there is much work to do in the field of radiation for benign conditions but it may well turn out that many patients benefit from radiation for diseases as diverse as thyroid, arthritis, keloids, heterotopic ossification of the hip, Dupuytren's contracture and more. Also, how European data is viewed by Americans will be crucial for this information to spread across this continent.