

REPORT

Avoiding the Radiation Dangers of Cardiac CAT Scans

By Michael Ozner, MD



When cardiac CAT scans are used during an emergency situation, they can provide critical diagnostic information about coronary blood flow that can help save a patient's life. This is the moment in which this technology shines.

Unfortunately, these machines produce an astounding amount of radiation exposure for the patient, often the equivalent of up to 750 chest X-rays. The problem is that too many health care professionals casually recommend these scans to patients who are asymptomatic and who just want to know what's going on inside their bodies. The radiation exposure from these tests can often lead to DNA breaks that may foster the initiation of cancer.

The medical profession may thus be on the verge of creating a dramatic increase in the number of cancer cases due to excess use of diagnostic tests that expose the patient to dangerously high levels of radiation. In fact, some of these tests expose the patient to more radiation than experienced by Japanese survivors of the atomic bomb blasts at Hiroshima and Nagasaki.¹

In this article, we will discuss how to balance the benefits and risks of CAT scans to maximize your current and future state of health.

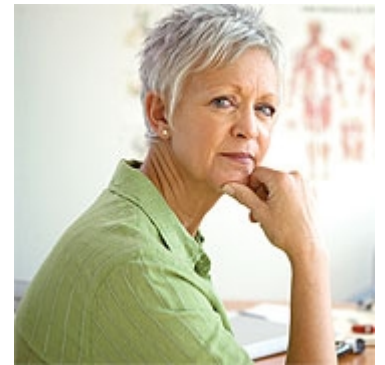
CAT SCANS: REVOLUTIONIZING DIAGNOSIS, BUT AT WHAT COST?

As a preventive cardiologist first hearing about the cardiac computerized axial tomographic (CAT or CT) scan, I thought it sounded close to miraculous: a simple, noninvasive, painless test that quickly provides a highly detailed picture of the heart, giving us the ability to pinpoint coronary blockages and other early signs of disease so we can treat them before any further damage occurs; or better yet, find nothing wrong with the heart, allowing us to reassure patients and let them go on with their lives.

However, it hasn't quite turned out that way. It is now apparent that CAT scans present many significant risks, especially when used for screening people with no signs or symptoms of disease. Too many people, including health care professionals, are not aware of these risks and, as a result, may be unnecessarily endangering health and even lives. Cardiac CAT scans do have an appropriate place as an important diagnostic tool. Unfortunately, due to aggressive marketing, they are now often used indiscriminately in many offices, clinics, walk-in centers, and hospitals throughout the country. Without a doctor's prescription, anyone can get a cardiac CAT scan while exposing themselves to excessive radiation, at times equivalent to over 500 chest X-rays.²⁻⁵

For many years, I have been concerned about the dramatic increase in the radiation exposure due to diagnostic testing performed by radiologists and cardiologists. While the intent is to use these tests to diagnose potentially lethal heart disease, we could be creating another problem: cancer.

Recently, the prestigious New England Journal of Medicine reported on this growing danger. Its report states that in America, there are currently more than 62 million CT scans being performed on patients each year, compared with just 3 million in 1980.¹ Furthermore, the article states that the radiation from these CAT scans can cause strand breaks in our DNA resulting in mutations linked to the creation of cancer. Currently, the authors suggest that over 20 million adults are being exposed to potentially unnecessary radiation. The article reaches the same conclusion that I have been speaking about for years: we need to urgently reduce the number of questionable CAT scans in order to dramatically reduce our risk of cancer.



Hopefully, with the growing awareness of this issue, both patients and doctors will become aware of the dangers of casual CAT scan use and begin to limit and keep track of the amount of radiation we are all being exposed to.

WHAT IS A CAT SCAN?

Invented in 1972 by Godfrey Hounsfield and Allan Cormack, who later won the Nobel Prize, CAT scans use both X-rays and computer technology to create detailed images of body parts, including the heart and other organs, bones, and muscles. Unlike traditional X-rays, the CAT scan X-ray beam moves around, creating many different views or “slices” of its intended subject. A computer is then used to combine these picture slices, resulting in highly detailed three-dimensional images that help cardiologists and other physicians to clearly visualize and diagnose disorders.⁶

CORONARY ANGIOGRAMS

Heart disease remains the number one killer of both men and women. Unfortunately, a large number of people discover that they have this condition only when they experience a heart attack or even worse—sudden cardiac death. As a result, there has been a push for many years to come up with an effective way to diagnose heart disease and avert such disasters.

Before CAT scans became widely available, our primary tool to diagnose a coronary artery blockage was the coronary angiogram or heart catheterization, an expensive, invasive procedure with potential serious risks. So it seemed a great advancement when the noninvasive coronary angiogram performed with CAT scanning came into use.

Today, we have the relatively new 64-slice CAT scanner, allowing people to walk into a scanning center and leave less than an hour later with complete, detailed pictures of their hearts or even their whole bodies. The 64-slice CAT scan takes thousands of images of the heart in just a few seconds, allowing a cardiologist to see detailed images of a patient’s heart and how it is functioning.⁷⁻⁹ Soon, the 128-slice CAT scan will be widely available, and even more precise machines are in the works.

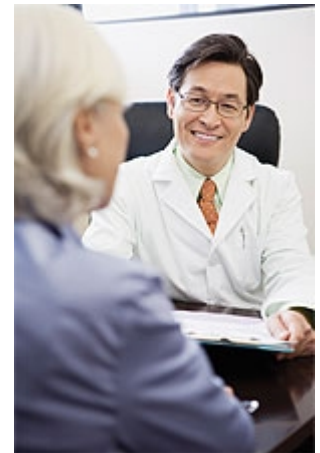
It is important to know that these whole-body scans, which have never been approved by the FDA, are available without a doctor’s prescription and have been heavily promoted through media advertising, endorsed by prominent physicians, and even highlighted on Oprah Winfrey’s TV show. A Time magazine cover story in 2005 summed it up: “How New Heart-Scanning Technology Could Save Your Life.”¹⁰ The rush was on for everyone to get 64-slice whole-body scans—even on an annual basis—to make sure nothing was wrong with them or to catch anything wrong in its early, treatable stages.

RISK VERSUS BENEFIT

I have no problem with CAT scans for patients who truly need these tests, such as those who show up in an emergency room with crushing chest pain. Using a 64-slice CAT scanner and other imaging modalities can help us make a very rapid diagnosis of whether or not these patients have blockages in their arteries causing a heart attack, blood clots in their lung, or dissection of their aorta.¹¹ In situations like these, CAT scans can unquestionably be life-savers.

In medicine, we are taught to use the “risk-benefit ratio,” a guide in helping us decide what intervention is appropriate for each patient and each situation. Cases like those in an emergency room, where a patient has obvious, life-threatening symptoms, require doctors to find out what’s going on as quickly and accurately as possible, in order to select the most appropriate treatment. In these instances, the obvious benefits of getting information from a CAT scan clearly outweigh any risks to the patients.

My quarrel is not with such life-saving situations for patients with critical symptoms, but with the new concept of using these tests as mass screening procedures for people who have no symptoms and just want to find out what’s going on inside their bodies, whether due to their own curiosity or a recommendation by health care professionals.^{12,13}



WHAT YOU NEED TO KNOW: AVOIDING THE RADIATION DANGERS OF CARDIAC CAT SCANS

- One of the most important advances in modern medicine was the development of computerized axial tomography (CAT or CT) scans.
- While they provide valuable information, CAT scans expose the body to a large amount of radiation far greater than earlier technologies like X-rays. Ionizing radiation produced by CAT scans is a known carcinogen.
- The annual number of CAT scans performed in the United States skyrocketed from 3 million scans in 1980 to an

estimated 62 million scans today. Many scientists believe an epidemic of radiation-induced cancer is imminent.

- Radiation exposure is cumulative over the course of a lifetime, and it is particularly damaging when it occurs at a young age.
- With one or more CAT scans, it is possible to accrue the amount of radiation exposure experienced by survivors of Hiroshima and Nagasaki, who later succumbed to cancer.
- While CAT scans have an important role in diagnosing symptomatic patients, they should not be used as screening tools for healthy individuals. There are no demonstrated benefits of screening asymptomatic patients, while the risks of radiation exposure are well documented.
- In healthy patients, a better preventive health strategy involves regular check-ups, screening for cardiovascular risk factors such as blood lipids, and practicing a healthy lifestyle.

THE DANGERS OF RADIATION

There are many problems with the widespread use of CAT scans for screening those without symptoms, but the most serious is the radiation that produces cumulative effects on our bodies. CAT scans are not simple chest X-rays that deliver a small amount of radiation. Instead, they deliver a significant amount of radiation exposure to the patient and, as we know, radiation has been shown to increase the risk of cancers, such as leukemia or breast cancer.¹⁴

We all receive “natural background radiation,” that is, radiation from the sun, radon gas, rocks in the ground, cosmic rays, food, and other sources in our daily lives that usually can’t be avoided. Measured in units called “millisieverts” (mSv), we can compare this natural radiation to the radiation we get from man-made sources, such as medical tests.¹⁵ For instance, a chest X-ray provides about 0.02 mSv or the equivalent of 2.4 days of natural background radiation; a CAT scan of the abdomen provides about 10.0 mSv, the equivalent of 500 chest X-rays or 3.3 years of natural background radiation.² What is of great concern is that a 64-slice whole-body CAT scan may deliver 15 mSv for men and 21 mSv for women (women’s denser body tissue and breasts require higher doses to get clear images), the equivalent of well over 750 chest X-rays.^{2,16} This is a significant difference, especially when you realize that the radiation you are receiving produces cumulative effects in your body.

As discussed in a June 19, 2007 article by Roni Caryn Rabin in *The New York Times*, recent studies indicate that Americans’ lifetime per-capita dose of ionizing radiation increased 600% between 1980 and 2006, with the bulk of this increase attributed to diagnostic imaging procedures.¹⁷ The World Health Organization, Centers for Disease Control and Prevention, and the National Institute of Environmental Health Sciences have all classified X-rays as carcinogens, based on the fact that they have been linked to leukemia and cancers of the breast, lungs, and thyroid.

The risk of a fatal cancer from a chest X-ray has been estimated as one in a million or more, which is very remote. But the risk of a fatal cancer in a person who had a CAT scan providing 10 mSv of radiation is dramatically increased and estimated to be one in 2,000.² As a way of comparison, Japanese survivors of the atomic bomb explosions at Hiroshima and Nagasaki, who have been found to face an increased risk of developing a fatal cancer, received on average a dose of between 5 and 20 mSv, with some as high as 50 mSv.¹ Since radiation exposure from all sources accrues over a lifetime, it’s clear that we’re going to quickly exceed the radiation exposure at Hiroshima and Nagasaki, and that CAT scans administered simply for screening purposes are exposing the American public to significant amounts of radiation, with the long-term risk of potentially fatal cancer.

There is no safe lower threshold of radiation exposure—all radiation is potentially dangerous. Of course, everyone is different and will not be affected by radiation in the same way. Even so, another important issue of note is how radiation interferes with the body’s natural immune system. Your body’s own defense mechanisms attack free radicals and cancer cells inside you, helping to keep you healthy. But a sudden blast of radiation can be just the impetus to upset this delicate balance, allowing previously contained malignant cell colonies to blossom into full-blown tumors.

I am not the only person worried about this. The American College of Radiology and the American Heart Association are very concerned about CAT scans exposing the American public to significant amounts of radiation, which could possibly lead to fatal cancers. Their joint year 2000 position paper stated that they do not recommend CAT scans for routine screening.¹⁸ Even avoiding screening heart CAT scans does not mean you are safe, as there are other elective procedures that deliver large doses of radiation, such as the virtual colonoscopy and the full-body CAT scans. Frighteningly, the full-body CAT scan may provide even larger radiation doses than chest or abdominal scans that cover a more limited area.¹⁹



So you can see that it's very easy to build up your cumulative dose of radiation exposure. If you follow some popular recommendations to have an annual CAT scan, you can quickly accumulate 50 mSv of radiation exposure from these tests alone, not to mention the additional radiation from other medical tests and natural sources. A few CAT scans, a virtual colonoscopy, a nuclear stress test, and a coronary angiogram could easily give you more radiation than a Hiroshima survivor who will eventually get a fatal cancer. This is a major problem that is not being addressed due to the fact that both patients and physicians are unaware of these substantial risks of these screening tools. It's not that all imaging tests are bad, but doctors and their patients need to weigh the risks and benefits for each test and make sure they select only those tests that are really needed for the patient's care.

COMPARISON OF RADIATION DOSES

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Procedure	Typical Effective Dose (mSv)	No. of chest X-rays for equivalent effective dose	Time for equivalent effective dose from natural background radiation
Chest X-ray	0.02	1	2.4 days
CAT head	2.0	100	243 days
CAT abdomen	10.0	500	3.3 years
Coronary angiogram	3.4	170	1.1 years
64-slice CAT (male)	15.2	760	5.1 years
64-slice CAT (female)	21.4	1070	7.1 years

Table 1: Radiation doses from diagnostic imaging procedures.^{2,16}

DIFFERENT GENDER, DIFFERENT AGE, DIFFERENT RISKS

When we talk about the radiation doses for various medical procedures, we are always talking about estimates, rather than exact figures. This is because the amount of radiation exposure can vary, depending on the facility where you have your CAT scan, who is performing it, what machine is being used, and what condition you may have, as well as your age and gender. As a result, the estimates we see are for an "effective dose," which may not be exactly what you get in your test.

A July 2007 study published in JAMA (Journal of the American Medical Association) found that the risk of cancer in people having 64-slice CAT scans of the heart is greater for young women than for men.²⁰ Researchers found that one of every 143 women scanned at age 20 will develop cancer, usually breast cancer; the risk for 40-year-old women falls to one in 284; and for men, the cancer risk was one in 686 for a 20-year-old and one in 1,007 for a 40-year-old. The reason for the difference in risk between women and men was found to lie in the fact that breast tissue is very sensitive to radiation and the heart can't be scanned without radiation exposure to breast tissue.



ARE WHOLE BODY SCREENING CAT SCANS EFFECTIVE?

Here's what most people do not realize: there are absolutely no data to prove that whole-body CAT scans for people with no signs or symptoms of disease are medically useful.

According to the FDA website:

"The FDA has never approved CT for screening any part of the body for any specific disease, let alone for screening the whole

body when there are no specific symptoms of disease at all. No manufacturer has submitted data to FDA to support the safety and efficacy of screening claims for whole-body CT screening.”²

It further states:

“...the FDA knows of no data demonstrating that whole-body CT screening is effective in detecting any particular disease early enough for the disease to be managed, treated, or cured and advantageously spare a person at least some of the detriment associated with serious illness or premature death.”

In addition, the American College of Radiology, the American College of Cardiology/American Heart Association, the American Association of Physicists in Medicine, and the American Medical Association, among others, do not recommend whole-body screening. Medicare and most insurance companies do not cover CAT scans for screening because the tests have never been shown to provide information that is additive to what we presently know by taking a medical history, performing a physical exam, and obtaining appropriate blood tests.

‘SUPER X-RAYS’ SET THE STAGE FOR FUTURE CANCER

Average Americans’ radiation exposure has increased dramatically since 1980, largely due to increases in the use of computerized axial tomography (CAT or CT) scans.¹ These “super X-rays” deliver far more radiation than conventional plain-film radiographs (X-rays). X-rays are classified as carcinogens by the World Health Organization and the federal Centers for Disease Control and Prevention.

Use of CAT scans has increased by more than a factor of 20 since 1980. While CAT has revolutionized diagnostic radiology, and immediate patient benefit/risk ratios are favorable, a new study, published in the *New England Journal of Medicine*, concludes that increased radiation exposure is setting the stage for future cancer cases.¹

“There is a strong case to be made that too many CT studies are being performed in the United States,” write the study’s authors. The greatest increases have been in diagnostic procedures in children (particularly in the diagnosis of appendicitis) and in elective screening procedures in adults (such as full-body scans and virtual colonoscopies). Children’s CAT scans are especially troubling, as children are more susceptible to the damaging effects of ionizing radiation than adults. “Perhaps 20 million adults and, crucially, more than 1 million children per year in the United States are being irradiated unnecessarily.”¹

EXCESSIVE COSTS

When CAT scan machines were first introduced in the early 1980s, they were heavily publicized and marketed. Because insurance did not normally cover the scans, patients typically paid all the cost out of their own pockets. Thus many people who were frightened by their family medical histories spent thousands of dollars in the hopes that the tests would “save their lives” by revealing hidden life-threatening conditions.²¹ Some of my own patients told me that imaging centers charged them up to \$2,500 for a single scan, and that many of these centers were run not by doctors, but by business people who were very aggressive in their marketing.

After all, hospitals, doctors, and scanning centers had invested several million dollars for each one of these scanners, and they naturally wanted to recoup their costs. Thus there was a lot of pressure on patients to have CAT scans when they may not have needed them, and a lot of marketing to doctors about how they could increase their income by using these machines in their practices. So in many cases, CAT scans were being sold to an unsuspecting public while the dangers were being completely ignored. Unfortunately, this is still largely the case.

WHAT CAN WE DO WITH THE TEST RESULTS?

Apart from the serious radiation issue, the biggest problem with CAT scans is figuring out what can be learned from the results. Here, we can look at different scenarios, depending on whether the results are normal or abnormal.

Let’s look at what happens if the results are normal. There are no data whatsoever to indicate that if you have a normal study, it means you are free to continue your undesirable lifestyle habits, such as smoking, eating an unhealthy diet, or being sedentary. However, if your CAT scan is normal, there is a very real danger that you will assume you are free of disease, and have no need to change anything—thus potentially continuing unhealthy habits.

One of the potential downsides is that when people get normal results from a CAT scan, they forget about the two most important factors in good health: a healthy lifestyle and appropriate medical therapy, when needed. Even when a doctor is involved and takes a moment to discuss the CAT scan results, the patient may walk away with the message, “I’m home free because my test was normal.” As a result, the patient is unlikely to make any meaningful changes to ensure continued good health.



We also have to consider the possibility that the test results produce a “false negative,” which means that a patient actually has health problems that either did not show up on the test or were not correctly interpreted. In this case, the patient has received a hefty dose of radiation, but has not received any useful information. This may significantly delay the doctor in diagnosing the developing health problem.

Now let’s assume that the test results come back abnormal, showing significant coronary calcium or a blockage. The doctor then often recommends a nuclear stress study and a coronary angiogram for further evaluation. These tests are not only costly; they also bombard the patient with even more radiation. For example, let’s assume that at the time of heart catheterization, an 80% blockage is discovered in one of the coronary arteries. The patient, who had no symptoms before the CAT scan, might then have a stent inserted to prop open the artery. You may think this is a great result and the patient will now be healthier and protected from a future heart attack.

However, there is not a shred of evidence that taking men or women with no symptoms and subjecting them to stents or bypass surgery will reduce the subsequent risk of heart attacks or prolong their lives. Putting stents in people with blockages, even those with 90% blockages, does not improve the clinical outcome beyond optimal medical therapy and lifestyle changes. These data have been well-established in the cardiology literature. Coronary stent insertion is best reserved for unstable patients in the throes of a heart attack or those who suffer from persistent chest pain, despite maximum medical therapy.

Thus by inserting a stent, you have not only failed to decrease the patient’s chances of having a heart attack, but you may have actually increased it. This is because putting a stent—a foreign body—in a stable blockage with a lot of calcium could actually trigger a sudden and catastrophic heart attack, stenosis, or even death.

THE PRIMARY DANGERS OF CONVENTIONAL CARDIAC CAT SCANS

My major concerns about cardiac CAT scans are as follows:

1. Excess radiation exposure.
2. Lack of proven risk/benefit assessment that favors usage.
3. Potential for additional tests and procedures that are costly, could have adverse health consequences, and are often unnecessary.
4. Use of scans to “motivate patients,” which could be better accomplished by talking to and educating patients about lifestyle changes.
5. Cost to patient and excessive profit to health care industry.
6. Safe, effective methods to accomplish the same goals are already available.

A BETTER APPROACH

For patients who have no symptoms, a far more effective approach to health promotion is for a physician to sit down with the patient, take a good history, see if there is a family history of heart disease, do a thorough examination, find out if the blood pressure is elevated, feel the pulse, listen to the heart, do an EKG and blood tests, and then talk to the patient about how to follow a healthy lifestyle, if the individual is not already doing so. If the patient’s blood pressure, blood sugar, or cholesterol is too high, the physician should then treat them with lifestyle changes and medical therapy as needed to achieve the appropriate goal.

The long-held belief that CAT scan results motivate people to change their lifestyles has been found untrue. A study in JAMA found that these scans did not change behavior in any way—abnormal scans simply did not motivate patients to change their lifestyles or take their medication any more regularly.²² Furthermore, is it appropriate to subject patients to the risk and expense of CAT scans to “motivate” them to do what they should be doing anyway?

Today, cardiologists know that it is possible to prevent the majority of cardiovascular disease through lifestyle changes, along with prudent medications, as needed. But despite this knowledge, we are doing many things, including administering an estimated 62 million CAT scans a year that have never been shown to reduce the risk of heart attacks or strokes, or prolong life.

The word “doctor” means “teacher,” and we doctors should be spending our time teaching patients how to live healthy lives, rather than ordering screening tests like CAT scans that have potential adverse consequences.

Another problem is that when doctors do take time to talk with patients and explain things to them carefully, they are not rewarded. I've been a preventive cardiologist for over two decades and have spent a lot of time with my patients teaching them how to stay healthy. You don't get paid for that, at least not in this country. In many other countries, such as Canada and France, doctors are paid for keeping their patients healthy, which appears to me to be a far more effective approach than a health care system that rewards intervention rather than prevention.

So it should be clear why I object to this mass screening of the “worried well,” and I hope the information in this article will help educate the public. We really need to get back to what we know works.

WHAT TO ASK YOUR DOCTOR

First and foremost, you should ask a doctor who recommends one of these CAT scans, “Is this scan truly going to change my management? Is it going to result in an improved outcome for my health?”

If you have risk factors for heart disease, you should also ask the doctor, “On my blood test, have you measured all the things that we know increase my risk of a heart attack?” That means not only total cholesterol, but low-density lipoprotein (LDL), high-density lipoprotein (HDL), and triglycerides. We also know that there are emerging risk factors that can be measured by blood tests, such as size of cholesterol particles, dangerous cholesterol particles called lipoprotein (a), and inflammatory risk markers such as C-reactive protein (CRP) and homocysteine. These tests can be done efficiently at very low cost and with no risk to the patient. In addition, there are safe and inexpensive tests that utilize sound waves, such as an echocardiogram and carotid ultrasound, which can be utilized for diagnosis and risk assessment. An ankle-brachial index is another safe and inexpensive test that compares blood pressure in the arms and legs to assess risk for vascular disease.

Every patient should ask, “What lifestyle choices should I be making to lower my risk of developing heart disease?” At that point, the doctor should discuss nutrition (I advocate the Mediterranean diet), prudent exercise (at least 30 minutes per day), stress management (such as yoga, breathing, or the relaxation response), and smoking cessation.

In the event that you and your doctor agree that a CAT scan is a medical necessity, you should ask “What is the radiation dose that I will be getting with this test? Are there any alternative tests, such as an MRI?” MRI, or magnetic resonance imaging, uses magnetic fields to generate images that help physicians diagnose disease, including coronary artery disease. Unlike CAT scanning, MRI does not produce any radiation exposure.

I strongly suggest that everyone keep a careful record of every test they undergo involving radiation, along with a notation on the amount of radiation that was received with that test. It is important that you have a good idea of approximately how much radiation your body has been exposed to and that you discuss this with your physician whenever any test involving radiation is recommended.

Of course, it would be better if every time someone was given a test involving radiation, they were informed of this, along with the amount given and the risks involved, but until that happens, the burden is on patients to protect themselves. You might also want to share the important information in this article with your family and friends, so they can protect themselves, as well.

In the meantime, do everything you can to stay healthy, so you will hopefully not need to undergo any tests using high doses of radiation, with their unknown long-term health risks.

In this vein, you might be interested to learn that a recent study showed that a brief 30-minute catnap at least three days a week can lower your risk of a heart attack by over 30%.²³ Even better, naps are free, accessible, and not associated with radiation.

CONCLUSION

While CAT scans can be appropriate and helpful for diagnosing symptomatic patients, their inappropriate overuse may be setting the stage for an epidemic of radiation-induced cancer. Contrary to media hype and aggressive marketing, CAT scans are not useful for screening healthy patients, and may actually do more harm than good by exposing individuals to dangerous radiation. All patients and physicians must diligently monitor radiation exposure, using techniques that produce radiation exposure only when medically necessary. Those seeking to ensure a healthy future are best served through practicing a healthy lifestyle and

regular check-ups. •

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For more information visit www.cardiacoz.com.

If you have any questions on the scientific content of this article, please call a Life Extension Health Advisor at 1-800-226-2370.

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