

Melanie Cole, MS (Host): Welcome to the podcast series from the specialists at Penn Medicine. I'm Melanie Cole, and today we're highlighting low-dose radiation therapy as a form of treatment for osteoarthritis. Joining me is Dr. Karishma Khullar. She's an Assistant Professor of Clinical Radiation Oncology at Penn Medicine.

Dr. Khullar, it's a pleasure to have you join us today. As we get into this topic, it's so interesting; I'd like you to tell us a little bit about osteoarthritis at the outset here, how prevalent it is and the impact of it on the quality of life of people living with it.

Karishma Khullar, MD: Sure. Thank you so much for having me. So osteoarthritis is the most common type of arthritis, and it typically affects the joints in the hands, knees, hips, and ankles. And it happens when the cartilage that lines your joints is worn down. So it was more colloquially known as wear and tear arthritis.

And this can cause symptoms such as pain, stiffness, and decreased flexibility. These symptoms are typically treated with a combination of physical therapy, pain medications, or creams and joint injections. And ultimately, if the symptoms are very severe and not responding to those measures, then you typically see an orthopedic surgeon and consider surgery.

And so, low-dose radiation is an alternative treatment for patients who haven't really responded to those more standard measures. And that's because at very low-doses, it's been shown to have strong anti-inflammatory properties.

Host: That is so interesting. Wow. So I'd like you to speak about the low-dose radiation therapy. How is it as far as the anti-inflammatory cells, for example, you just mentioned.

Karishma Khullar, MD: Typically a lot of patients are on things like ibuprofen or Tylenol and medications have generally a pretty clear way of working. So, for example, ibuprofen inhibits an enzyme that's called cyclooxygenase and that prevents the production of prostaglandins, which cause inflammation in osteoarthritis.

Studies have shown that low-dose radiation impacts the production of cytokines, which are chemicals that play a role in inflammation.

Host: So as this is hitting the landscape of treatment options, speak about patient selection.

Karishma Khullar, MD: Typically, when I think about treating somebody with low-dose radiation for osteoarthritis; first, I want them to have a formal diagnosis. So that means having x-rays of the affected joint. And typically I want them to have tried the more standard treatment. So when patients see me for consultation, I discuss what treatments they've tried, how much medication they're on, have they gone to physical therapy, have they had joint injections.

And we discuss, if they've seen an orthopaedic surgeon, is surgery something they'd want to consider? Are they able to undergo that? And typically once they've given, these more standard measures a serious try, that's when I think it's appropriate to consider low-dose radiation.

Host: What locations on the body as we think of osteoarthritis and I'm an exercise physiologist, so I've been working with people for 35 years that have various types of arthritis and where is it that this might be effective?

Karishma Khullar, MD: We can treat a lot of the joints affected with osteoarthritis. I've treated knees, I've treated hips, I've treated hands, wrists, ankles, shoulders. Those are all locations as long as there's a documented x-ray with osteoarthritis that we could treat with radiation.

Host: I'd like you to speak about the outcomes for low-dose radiation therapy. Is this a cure? Is it a temporary bridge? Compare and contrast the use of medication. Some people are on them for a long time.

Karishma Khullar, MD: I would say there's a large variation in response rates for low-dose radiation for osteoarthritis. retrospective studies have shown response rates of anywhere from 60 to 90 percent. But when we look at randomized trials, the response rates have been around 40 percent. And I've seen this variability in response rates in my own practice as well.

So I have some patients who have had an amazing response just after a couple of radiation treatments, whereas some have not had as much of a response. And so we're still working out which patients will derive the most benefit and how durable the response is. But given that it's a non-invasive treatment and has minimal side effects, I think it's a really good option to try, especially if patients, as you've mentioned, have been on medications for years or have tried injections. And it doesn't really seem to be working. I think this is a good option.

Host: Is the experience of someone receiving it similar to that of, say, cancer patients? Do they have a consult simulation, for example?

Karishma Khullar, MD: The general process is similar but the intent of treatment and the dosing differs quite significantly. Generally, patients have a consultation and that's where I would like them beforehand to have a formalized diagnosis of osteoarthritis. So they would meet with me. I would discuss what treatments they've tried in the past.

I discuss low-dose radiation. And then they have a planning session, which is called a simulation. So this process is similar to what cancer patients would go through. basically the planning session entails a CT scan of the affected joint. after I get this CT scan, it takes me about a week and a half to plan the treatment, and then the treatments themselves are delivered twice a week for three weeks.

The actual time on the treatment table is about 20 minutes per session but it has very minimal side effects and it's very low-dose.

Host: How do patients handle it? How have they been?

Karishma Khullar, MD: Patients have had no significant side effects. Sometimes because I'm treating the area, you might get a little bit of a pain flare. So the pain gets a little worse before it gets better. Most of the time, that's managed with medications that the patients have already been taking for their osteoarthritis.

Other than that, there's really no significant side effects. A lot of patients don't feel anything during it. and so it's a very, once you kind of understand the process and get into the routine of the twice a week for three weeks of treatment; it's a very simple treatment to get through.

Host: Because this is such a low-dose, does it not lead to the fatigue that patients sometimes can experience?

Karishma Khullar, MD: Correct. Typically, at this low-dose, you don't really experience significant fatigue. So, when talking about what low-dose radiation means, I think it's really helpful to start out with a frame of reference for what standard doses of radiation are. So the units used to measure radiation is a gray.

And the doses that we use for different types of cancers are variable. But for example, for a lot of gastrointestinal cancers, the dose is around 50 gray. And for prostate cancers, the doses are in the range of 70 gray. But when I'm talking about low-dose radiation it's a dose that's much, much lower than a standard dose.

For osteoarthritis in particular, the total dose that you receive over these six treatments is three gray. And so this is a very low-dose. Essentially over several months, this could be considered the amount of radiation you're exposed to just as part of background.

Host: Thank you Where do you see the research going, Dr. Khullar?

Karishma Khullar, MD: We really want to figure out which particular patients have the most benefits, so as I mentioned, there is a bit of variability in the response that I've seen. So really trying to understand which patients, after a couple of treatments, you know, are saying that this is the most amazing treatment ever, versus which patients are saying, "you know, we tried this. It doesn't really have many side effects," but I didn't get the relief that I was expecting. So I think trying to differentiate who has a response and who doesn't, and alongside that, the durability of the response is where the research is going to be going.

Host: Thank you so much for this interesting topic. As we wrap up, where can patients receive this treatment at Penn Medicine? And how would someone refer a patient to you for evaluation?

Karishma Khullar, MD: Patients can receive this at the Perelman Center for Advanced Medicine in our Radiation Oncology Department, as well as in our Radiation Oncology Departments at Penn Presbyterian Medical Center, Pennsylvania Hospital, and Penn Medicine Cherry Hill. As far as, getting treatments, any patient can call the Radiation Oncology Department Access Center.

This is, 215-615-6767. They can request a consultation with me. And if a provider works within Penn Medicine and wants to refer a patient, they can also send my team a direct referral through the medical record.

Host: Thank you so much, Dr. Khullar, for joining us today. And to refer your patient to Dr. Khullar at Penn Medicine, please call our 24-7 provider only line at 877-937-PENN, or you can submit your referral via our secure online referral form by visiting our website at [pennmedicine.org/referyourpatient](https://www.pennmedicine.org/referyourpatient).

That concludes this episode from the specialists at Penn Medicine. I'm Melanie Cole.