Targeted Radiation Reduces Pain from Cancer Metastases in the Spine

People who received this form of radiation therapy for spinal metastases were pain-free up to 6 months after treatment.

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Pain caused by cancer that has spread, or metastasized, to the spine is a major problem for many patients. New findings from a clinical trial indicate that, for some patients with painful spinal metastases from advanced cancer, a type of precise, high-dose radiation therapy may be a highly effective way to relieve that pain.

About a third of people in the clinical trial who received this form of radiation therapy, called stereotactic body radiation therapy, or SBRT, for spinal metastases were pain-free up to 6 months after treatment, compared with only about 15% of people who received conventional external beam radiation therapy to treat the pain.

“This is one way to help patients with metastatic disease in a tangible way: by reducing pain,” said Arjun Sahgal, MD, of the Sunnybrook Health Sciences Center at the University of Toronto, who led the study and presented the results on October 26 at the 2020 Annual Meeting of the American Society for Radiation Oncology.

These results cannot be applied to all people with spinal metastases, cautioned Jeffrey Buchsbaum, MD, PhD, of NCI’s Radiation Research Program, who was not involved with the study. But for select people who have a limited number of tumors in the spine, “SBRT is a new standard of care,” he said.

A Painful Location

When cancer spreads from its original location, metastatic tumors can arise in many distant sites. Bone is a common site of metastasis for a number of cancer types.

Unfortunately, once cancer cells take up residence in bone, pain can be a devastating side effect, as the growing tumor destroys the surrounding cells. For people who have metastatic tumors growing in the bones of the spine, “the pain can be insurmountable,” even with high doses of pain medication, Sahgal said.

Doctors may try radiation therapy to shrink these tumors and reduce the pain they cause. But

conventional radiation therapy doesn't effectively control pain in most people with spinal metastases, explained Dr. Sahgal. This is because the dose of radiation must be kept relatively low to avoid damaging the spinal cord itself, which can sit just millimeters away from a tumor.

In recent years, because it can more precisely target tumors, SBRT has come to be widely used for people with only a few, small metastatic tumors (known as oligometastatic cancer), including those in the spine, he added. Some studies have shown that if these few metastases can be successfully treated, patients may live for years or decades.

Because of their potentially good prognosis, people with oligometastatic cancer were thought to be more likely than people with advanced metastatic disease to benefit from SBRT, which is more expensive and has a higher risk of causing some types of damage in the spine than conventional radiation therapy, Sahgal explained.

But the limitations of conventional radiation therapy as a palliative treatment for people with advanced cancer and spinal metastases eventually led researchers to wonder if SBRT might also be a better option for people with limited life expectancy.

Boosting the Radiation Dose

A previous trial didn't show a difference between SBRT and conventional radiation therapy in their ability to relieve spinal pain in people with three or fewer sites of spinal metastases.

But there were several key differences between that trial and the current study, Sahgal explained. The previous trial used a lower dose of SBRT, given in a single session. The current study used a higher total dose of radiation for SBRT—a dose high enough to potentially destroy (ablate) the metastases. SBRT was also given in two sessions, a process called fractionation.

In addition to the higher dose, laboratory experiments have suggested that fractionation itself may actually make radiation more effective at killing cancer cells, said Sahgal.

The new study also used a method to score pain that took into account the amount of pain medication needed by individual patients for relief, to make sure the effects of palliative radiation therapy weren't masked by painkiller use. "This is a very robust way to show if we actually improve their outcomes," he explained.

The new study included about 200 people with three or fewer spinal metastases in a concentrated area of the spine that were the sole source of their pain. None had measurable signs of instability in the bones of the spine, which would increase the risk of fracture and make it harder to assess pain.

Half of the participants received the two sessions of SBRT, for a total dose of 24 Gy (a Gy, short for Gray, is the standard measurement of radiation dose). The other half received 20 Gy of standard radiation—the maximum considered to be safe when using conventional radiation therapy—split over five sessions.

Double the Pain Relief

Three months after treatment, 35% of people in the SBRT group reported that their spinal pain was gone, compared with 14% of the people who received conventional radiation therapy.

This benefit was sustained over time. At 6 months, 32% of people in the SBRT group were still pain-free, compared with 16% of the conventional radiation group.

“That’s a major gain for these patients,” said Sahgal. “The relief that they were getting continued in the longer term.”

Measurements of spinal stability after 6 months were about the same in both groups. The risk of compression fractures was also similar in both groups, and the risk of serious fractures was minimal, the researchers reported. There were also no reports of damage to the spinal cord caused by the radiation treatments.

Further Pushing the Limits

“It isn’t surprising that a higher radiation dose is better, but [modern] SBRT technology is what allowed that dose to be delivered safely,” said Buchsbaum. “In short, careful patient selection and a higher dose yielded the expected results.

“Moving forward, it’s important that practitioners apply this treatment approach on patients with limited spinal metastases, and not the general population of all patients with spinal metastases,” he added.

“This isn’t for the patient who has pain everywhere [in the spine], which is unfortunately the majority of patients,” agreed Sahgal. “But if you have a defined region of metastatic disease in the spine, and you can pinpoint the pain to that region, that’s going to be who benefits.”

His team hopes to test if further pushing the limits of spinal SBRT could help a greater number of patients with limited spinal metastases. They plan to test both 28 Gy in two fractions, and an “ultra-high” single dose of 24 Gy, to see if either regimen can reduce pain in more patients while maintaining the level of safety seen in the current trial.

They are also designing trials to see if SBRT can eliminate pain from bone metastases in other parts of the body, such as the arms or the ribs, Sahgal explained.

“There’s data that suggests it will, but we need to prove it,” he said. If it can, “that will change the game overall for patients with bone metastases.”

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