

Shutting out soft tissue cancers in the cold

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Cryotherapy, an interventional radiology treatment to freeze cancer tumors, may become the treatment of the future for cancer that has metastasized in soft tissues (such as ovarian cancer) and in bone tumors. Such patients are often not candidates for surgery and would benefit from minimally invasive treatment, say researchers at the Society of Interventional Radiology's 35th Annual Scientific Meeting in Tampa, Fla.

"Improved treatment options are needed for individuals affected by metastases in bone and [soft tissues](#) since patients with multifocal metastatic disease are often not candidates for surgery," said Peter J. Littrup, M.D., an interventional radiologist and director of imaging research and image-guided therapy for the Barbara Ann Karmanos Cancer Institute in Detroit, Mich. "Percutaneous soft tissue cryotherapy is a well-tolerated treatment option, especially for patients with anesthesia risks, painful lesions or those seeking local control during chemotherapy. Tumor size and/or location do not preclude thorough treatment or pose greater risk with appropriate precautions," added Littrup, who is also a professor of radiology, urology and [radiation oncology](#) at Wayne State University in Detroit. In the 97-patient study, researchers used sufficient deadly temperatures to effectively kill tumor cells, resulting in an average of 77 percent [tumor shrinkage](#) in patients after 24 months. "Because of the variable placement of tumors within these soft tissue and bone locations, this study shows the versatility of this treatment option when using proper techniques to safeguard nearby structures. Aside from the successful tumor control, what makes this technique even more preferable is the excellent tumor shrinkage since

the underlying fibrous or collagenous structures are preserved. The body can then better heal at the ablation (removal) site with minimal additional scar tissue formation," said Littrup.

Last year, it was estimated that 1.5 million new cases of cancer were diagnosed, and up to 85 percent of patients who have breast, prostate or lung cancer have bone metastases at the time of death. Additionally, 5 percent of all cancers result in skin cancer as well. Based on these numbers, conservative estimates determine that up to 500,000 of these newly diagnosed cancer patients alone will suffer from metastatic disease in bone and soft tissue areas. Cryotherapy is a good option for a large—but perhaps under-recognized—problem that could deliver a quantum impact. Namely, the original cancer tumor site (or even a few unresponsive tumors sites) can still cause cancer management problems even after a generally good response to chemotherapy and/or radiation therapy, said Littrup. "Metastasized tumors can occur nearly anywhere in the body and frequently cannot receive additional radiation therapy or would be difficult or very morbid to be controlled with surgery," said Littrup. "Cryotherapy was able to preserve quality of life by providing good local treatment with minimal side effects, especially with advanced stages of cancer where any additional treatment is unlikely to provide a systemic cure," he added. However, cryotherapy is not a first-line therapy for tumor treatment. Despite "superb" cryotherapy outcomes for many tumor types and locations, medical insurance may not cover the treatment, said Littrup.

Historically, cyoablation has been performed on the prostate and liver, but this technique has been recently found effective in other tumors including the breast, kidney and lung. "We simply translated this concept to retroperitoneal, intraperitoneal, superficial and bone locations in order to generate successful use of cryotherapy in different patient groups," said Littrup. The major benefits of cryotherapy are its superb visualization of the ice treatment zone during the procedure, its low pain

profile in an outpatient setting and its excellent healing with minimal scar, said Littrup. In this study's cryotherapy treatment, researchers used several needle-like cryoprobes that were inserted through the skin to deliver extremely cold gas directly to a tumor to freeze it. This technique has been used for many years by surgeons in the operating room; however, in the last few years, the needles have become small enough to be used by interventional radiologists through a small nick in the skin, without the need for an operation. The "ice ball" that is created around the needle grows in size and destroys the frozen tumor cells. Surgeons and radiation oncologists have long tried to provide at least a 1-centimeter margin of treatment with cancer tumors, and it was important to assure a similar "surgical margin" of lethal temperatures beyond all tumor margins by cryotherapy in this study, said Littrup.

"One of our first soft tissue cryotherapy patients with recurrent ovarian cancer encouraged us to really begin this study. She appropriately noted that with recurrent cancer, second- and third-line chemotherapy drugs can run up to \$20,000-\$25,000 per month and that additional debulking surgery needed at least an additional month of recovery," said Littrup. This patient has now undergone seven cryoablation procedures over the last five years in combination with only a few additional cycles of chemotherapy when more than one to two recurrences were noted, he said. "She called cryotherapy a major 'holiday' from chemotherapy and has been one of our big advocates, referring many other ovarian cancer patients with isolated recurrences," said Littrup.

In the study, 157 computed tomography/CT- and/or ultrasound/US-guided percutaneous cryotherapy procedures were performed (retroperitoneal, 30; intraperitoneal, 51; superficial, 47; and bone, 29) in 97 patients. Protection of adjacent crucial tissues (for example, skin, bowel) from cytotoxic temperatures was achieved by thermocouple monitoring, saline injection and/or direct skin warming. Patients were followed by CT or magnetic resonance imaging (MRI). The cryotherapy

zone was well-defined by CT as a hypodense ice ball with an average ablation diameter of 5.4 centimeters; average tumor diameter was 3.5 centimeters.

Interventional radiologists are leaders in percutaneous cryotherapy because it requires interventional skills and a thorough understanding of cross-sectional imaging (US, CT, MRI) and IRs are the only physicians who have this rigorously trained skill set combination, said Littrup. Continued study is needed to determine the optimum probe number, spacing and freeze times needed to produce thorough ice coverage of all soft tissue tumors, he said. "With recent developments of powerful new cryotechnology, multiple directions for soft tissue cryotherapy can be pursued, including translating the current, somewhat challenging, procedure done with ultrasound and/or CT guidance to a more consistent and reproducible MR-guided approach," said Littrup. Cryotechnology promises to be more MR-compatible and would also allow accurate targeting of more difficult-to-see tumors. More importantly, larger studies in multiple centers needs to be done, following these basic cryobiology principles of sufficient lethal temperatures generated by multiple cryoprobes spaced evenly throughout a cancer region, he added.

Provided by Society of Interventional Radiology

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