

Bone Cancer

Spread or “metastasis” of tumor cells to bone is a common problem in cancer patients. Bone is the third most common site of tumor spread, behind only liver and lung. Each year, about 100,000 bone metastases are reported in the United States, with bone metastases most commonly occurring in patients with breast, prostate, lung and kidney cancer.

When tumor cells enter the blood stream and subsequently pass into the marrow of the bone, they begin to multiply and grow. This growing tumor destroys the bone around it and invades nerve fibers in and around the bone. If untreated, bone can become weakened and potentially fracture. Pain can become severe and even disabling, requiring large doses of narcotic medications to control. Bone metastases that are at risk of fracture, particularly the bones of the legs, may be treated surgically, often with placement of a metal rod to stabilize the bone. External radiation is currently the standard of care in patients with bone pain. Radiation results in reduction in pain for a majority of patients. However, this can take 4-6 weeks to improve symptoms and about 20-30% of patients with bone pain will not respond to radiation therapy. Some patients who have recurrent pain at sites of previous radiation therapy cannot be retreated with radiation due to dose limitations of radiation treatment.

Image-guided interventional radiologic treatment of bone tumor has rapidly evolved and proven effective in treatment of certain metastatic bone tumors. This treatment has been seen to be particularly well suited to patients with only one or a few metastatic lesions, especially if these lesions are locally destroying bone (lytic), often seen in lung and kidney tumors. Interventional treatment is more difficult and typically not utilized in more dense (blastic) metastatic tumors, typically seen with prostate and breast cancers.

Procedures commonly utilized by the interventional radiologist in the treatment of metastatic bony tumor include embolization, radiofrequency ablation, and methacrylate injection.

Watch a short video on interventional treatment of bone tumors (copyright Society of Interventional Radiology)

Embolization

Embolization is utilized to decrease blood flow to tumor. It may be used prior to surgical removal of tumor to greatly decrease blood loss during surgery. It may also be used in combination with radiofrequency ablation of tumor. During the embolization procedure, a tiny plastic catheter is advanced into the artery at the top of one leg and is then guided under x-ray visualization into the vessel supplying the particular bone and the bone tumor. This small catheter is advanced into the vessel as close to the tumor as possible and very tiny plastic particles are then injected to block the blood vessels going to the tumor. When used in combination with radiofrequency ablation of tumor, this decreased blood flow helps to promote cell death during the ablation procedure.

Radiofrequency Ablation

Radiofrequency ablation (RFA) is a rapidly growing technology that can be very effective in appropriate cases of metastatic tumor. A needle is guided through the skin using CAT scan guidance with the tip of the needle placed into the tumor. An electric current is then administered through the needle, causing heating of the cells around the needle and resulting in tumor death. The needle is then removed and a small bandage applied. The procedure usually takes about 30 minutes to treat a single lesion, and several lesions can be treated in a single session if necessary. In one multicenter study, 59/62 patients (95%) experienced a clinically significant drop in their pain level and required less medication to control pain.

Methacrylate Injection

When there is concern about possible fracture through a lesion following ablation, methacrylate injection (osteoplasty) may be utilized. Methacrylate is a glue-like cement, acting to replace destroyed bone in area of metastatic tumor. The cement can be injected through the needle used to guide the RFA probe into place, prior to its removal. The methacrylate may also have the effect of killing some nerve fibers in the area of destroyed bone, augmenting pain relief.

As with all tumors, close follow-up is needed after interventional treatment. Additional lesions may be able to be treated with repeat intervention, if appropriate.

Treatment of Benign Tumors

While effective in treating cancerous tumors to bone, RFA can also be useful in treatment of some benign, non-cancerous lesions of bone. One particular benign lesion, osteoid osteoma, responds particularly well to RFA, rapidly relieving pain which can be very problematic with this particular entity.