CRYOABLATION IN THE MUSCULOSKELETAL SYSTEM

Jeffrey J. Hebert, Kirkland W. Davis, James J. Choi, Donna G. Blankenbaker, Michael J. Tuite, Fred T. Lee Jr.

Department of Radiology, University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin USA

Introduction
Pen palpation can be challenging in patients with metastases to the musculoskeletal system. Conventional therapy includes combinations of systemic and local radiation, chemotherapy, surgery, opioid analgesics, and radionuclide therapy. However, efficacy of pain management can be different in patients with metastatic lesions. The choice of therapy is less clear when considering evolution of radiation, chemotherapy, surgery, and radionuclide therapy. Cryoablation is fast becoming a definitive treatment for selected patients with metastases. This therapy, first developed in the 1970s, has been used as a method to treat MSK tumors in the early 1980s. The technique has been further used for MSK tumors in the early 1980s.

History, Cryosurgery
• Treating tumors with cold temperatures began in the 1800s. First used for metastatic renal tumors in the early 1900s.
• Direct intracavitary instillation of cold saline into a tumor cavity destroyed the metastases.
• Percutaneous and endoscopic cryosurgical technology was successfully tested in the 1970s in the prostate, liver, and other tissues.
• Radiofrequency (RF) ablation has proved to be the most effective method in image-guided ablation of bone and soft tissue metastases.
• Although technology is currently in use in some institutions, clinical trials are ongoing to further define the role of cryosurgical technology in these applications.
• Our experience and the preliminary data from other trials are encouraging for cryosurgery in the MSK system.

Cryosurgery: Advantages
• Advantages of cryoablation in the musculoskeletal system.
• Cryoablation systems are currently available from two manufacturers: Endocare, Incorporated (Irvine, CA) and Galil Medical (Westbury, NY).
• Pain palliation can be challenging in patients with metastases to the musculoskeletal system. Conventional therapy includes combinations of external beam radiation, chemotherapy, surgery, opioid analgesics, and radionuclide therapy. However, efficacy of pain management can be different in patients with metastatic lesions. The choice of therapy is less clear when considering evolution of radiation, chemotherapy, surgery, and radionuclide therapy. Cryoablation is fast becoming a definitive treatment for selected patients with metastases.
• Cryoablation systems are currently available from two manufacturers: Endocare, Incorporated (Irvine, CA) and Galil Medical (Westbury, NY).
• Pain palliation can be challenging in patients with metastases to the musculoskeletal system. Conventional therapy includes combinations of external beam radiation, chemotherapy, surgery, opioid analgesics, and radionuclide therapy. However, efficacy of pain management can be different in patients with metastatic lesions. The choice of therapy is less clear when considering evolution of radiation, chemotherapy, surgery, and radionuclide therapy. Cryoablation is fast becoming a definitive treatment for selected patients with metastases.

Cryosurgery: Disadvantages
• Slightly wider gauge than typical RF probes, creating slightly more tissue damage.
• While skin burns are not a risk as they are with RF ablation, freezing the skin is possible.

Technologies
• Cryosurgical system: temperatures between -80°F and -100°F are obtained.
• Cryoablation probes should be 2 cm apart and about 1 cm from the periphery of the lesion.

Procedure Details
• Cryoablation of MSK metastases requires meticulous planning.
• Probe separations depend on the desired size and shape of the ice ball formed.
• Temperature at which tissue necrosis occurs varies with tissue type, but RF ablation is a standard technique.
• Cryoablation has been used in a combination of tumor ablation and cryoablation.
• Many lesions require multiple probes to be used in concert, creating a much larger ice ball.

Case Examples
Case 1
A 49-year-old male with colon cancer metastases to the left inferior pubic ramus and sciatric nerve.

Case 2
A 54-year-old male with renal cell carcinoma metastases to the right iliac crest.

Case 3
A 62-year-old female with breast cancer metastases to rib and chest wall.

Advantages of Cryoablation
• Cryoablation is a totally noninvasive procedure.
• Unlike RF ablation, one can safely monitor the size of the lesion and the status of the lesion during the procedure.
• The procedure is performed under local anesthesia.
• For smaller lesions, general anesthesia is avoided and the procedure may be performed under conscious sedation.
• Intravenous analgesics can be especially advantageous during the diagnosis and procedure, as tissue that is fully frozen and painless is likely to be more available when involved in a solid tumor.
• Because cryoablation can be active at one site and a single image (Figure 10), very tight leeks are required, minimizing short-term complications.
• Cryoablation is an effective method of delivering cryoablation to the musculoskeletal system, allowing ablation of ice basketball geometry on an active basis.

References