



# Microwave Ablation for Palliation of Bone Metastases

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Bone metastases are the most common source of pain for patients with cancer. For pain that is refractory to conventional measures, microwave ablation (MWA) is an emerging alternative therapy. Studies show that MWA is effective in reducing pain and analgesic requirements while improving function. This article describes studies of MWA that include patients with bone metastases to a variety of locations from a range of primary malignancies. Although studies are limited, MWA has proven to be well tolerated with impressive efficacy.

## At a Glance

- Microwave ablation (MWA) is a promising option for patients with metastatic disease to bone that is resistant to traditional treatments.
- MWA reduces pain almost immediately in many patients, with relief lasting as long as a year.
- MWA is well tolerated, with the most common complications including increased pain, infections, and postablation syndrome.

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Bone metastases are the most common source of pain in patients with cancer (Brescia et al., 1990). This condition affects 47%–75% of patients with metastatic breast cancer and 90% of patients with metastatic prostate cancer (Bubendorf et al., 2000; Coleman, 2001; Hess et al., 2006). Patients with metastatic lung, thyroid, or kidney cancer have a 33% chance of their disease spreading to the bone (American Cancer Society, 2014). In addition to inducing severe pain, bone metastases can cause impaired mobility, fractures, and decreased quality of life (Pusceddu, Sotgia, Fele, & Melis, 2013). Methods of palliation include treatment tar-

geted at lesions and systemic anticancer therapies. These approaches include radiotherapy, hormonal therapy, bisphosphonates, chemotherapy, analgesics, surgery, and radiopharmaceutical therapy. However, for patients whose pain is refractory to these modalities or are ineligible for certain methods, ablative techniques are emerging as a promising option (Kastler et al., 2013). These methods include cryotherapy, radiofrequency ablation, ethanol ablation, high-intensity focused ultrasound, laser ablation, and microwave ablation (MWA), with this modality having potential advantages over other methods (Simon, Dupuy, & Mayo-Smith, 2005).

Although methods and equipment vary, one example of performing delivering MWA is using 14.5-gauge needles to deliver electromagnetic waves to lesions. Patients receive conscious sedation and are closely monitored with pulse oximetry, electrocardiography, and blood pressure checks. After sterile draping and local injection with lidocaine, a transducer is placed over the tumor using either ultrasound or computed tomography. An antenna is threaded through the transducer to reach the lesion (Simon et al., 2005). The antenna delivers as much as 60 watts of microwave power at a frequency of 900 MHz. The microwaves concuss the water in tumor cells, causing friction and heat and leading to cell death. After the treatment, the antenna is removed, followed by the transducer (Simon et al., 2005). The procedure lasts from 1–13 minutes (Botsa, Mylona, Koutsogiannis, Koundouraki, & Thanos, 2014; Kastler et al., 2013; Kastler, Alnassan, Aubrey, & Kastler, 2014; Wei et al., 2015).

## Current Research

MWA can be widely applied in patients with a variety of primary malignancies. Of the six studies published that assess the efficacy of MWA in palliating symptomatic bone metastases, all show a significant improvement in pain scores (see Table 1). Kastler et al. (2013) found that 93% of patients experienced immediate relief that was maintained for an average of 5.5 months. In 8 of 15 patients, analgesic medications were discontinued, and, in 5 of 15 patients, opioids were replaced with nonsteroidal anti-inflammatory drugs (NSAIDs).