

**WHITE PAPER ON UNMET MEDICAL NEEDS & CHALLENGES**  
**Improved Image Monitoring of Radiofrequency Ablation of Breast Cancer**

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A major goal of breast-conserving treatment for breast cancer is the preservation of a cosmetically acceptable breast. Although a variety of patient, tumor, and treatment factors have been reported to influence the cosmetic result, the amount of breast tissue removed appears to be the major factor. Several investigators are studying the feasibility of percutaneous minimally invasive techniques to ablate breast tumors. By minimizing damage and disruption to normal surrounding tissue, the morbidity of the local treatment, such as scarring and deformity, can be reduced and cosmetic result can potentially be improved. With the widespread application of screening mammography the mean size of the breast tumors detected has continued to decrease which further emphasizes the need for less invasive means for achieving local tumor destruction such as radiofrequency ablation.

We have completed a phase II study designed to determine the efficacy and safety of radiofrequency ablation of early human breast cancer using the saline-cooled tip electrode. In this trial we ablated the tumor and then immediately removed it and pathological evaluation demonstrated non-viable tumor cells in over 90% of the patients.

The obvious next step is to be able to ablate the breast cancer and then NOT to remove the destroyed tumor. However, this progress is greatly hampered by the following 3 major limitations:

1. Currently we use ultrasound to monitor tumor destruction in real time, however this modality is currently very inaccurate. The ablated tumor just appears as an indistinct white area.
2. Secondly there is no technology currently available to assess whether any viable tumor has been left behind after ablation which is necessary for this technology to be adopted by the oncologists and the patients
3. Finally, there is a lack of a minimally invasive percutaneous or non-invasive transcutaneous mechanism of outpatient monitoring of the ablated cancer. Current modalities such as CT-PET and MRI all have limitations, as they can be unreliable for up to 6 months after the procedure.

The health impact of breast cancer in United States is considerable where it is estimated that approximately 182,800 women will be diagnosed with invasive breast cancer, and approximately 40,800 women will die from breast cancer. <sup>1</sup> Breast cancer is the second most frequent cause of cancer deaths among American women, accounting for 18% of all cancer deaths among women. Despite astonishing advances that have been made in the detection, treatment, and even chemoprevention of breast cancer over the past decade, surgery remains the cornerstone of therapy for almost all women diagnosed with the disease. Hence a focus in addressing the current limitations of radiofrequency ablation of breast cancer is an area of great unmet medical need.

## References

1. Khatri VP, McGahan JP, Ramsamooj R, Griffey S, Brock J, Cronan M, Wilkendorf S. [A phase II trial of image-guided radiofrequency ablation of small invasive breast carcinomas: use of saline-cooled tip electrode.](#) Ann Surg Oncol. 2007 May;14(5):1644-52. Epub 2007 Feb 15.
2. Zhang L, Wang ZB. [High-intensity focused ultrasound tumor ablation: review of ten years of clinical experience.](#) Front Med China. 2010 Sep;4(3):294-302. Epub 2010 Aug 10.
3. Yoon J, Cho J, Kim N, Kim DD, Lee E, Cheon C, Kwon Y. [High frequency microwave ablation method for enhanced cancer treatment with minimized collateral damage.](#) Int J Cancer. 2010 Dec 10. [Epub ahead of print]