Noninvasive imaging technique protects healthy tissues during freezing of cancer lesions

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A solution to a major challenge in using minimally invasive cryotherapy to target and kill cancer cells with freezing temperatures while protecting adjacent healthy tissues has been reported by a research team in Texas in an article published this week in the *Journal of Biomedical Optics*. The journal is published by SPIE, the international society for optics and photonics.

Cryotherapy may be used to treat internal and external cancer lesions. Patients benefit from fast recovery, low toxicity, minimal anesthesia, and comparatively low cost.

However, a major difficulty until now has been finding an efficient method of monitoring temperatures in real time in order to avoid damaging non-targeted tissues.

In "Imaging technique for real-time temperature monitoring during cryotherapy of lesions," authors Elena Petrova, Anton Liopo, Vyacheslav Nadvoretskiy, and Sergey Ermilov of TomoWave Laboratories, Inc., in Houston describe a new technique for monitoring temperature that addresses this problem.

"Petrova *et al*. report the use of red blood cells as temperature sensors to convert reconstructed optoacoustic images to temperature maps," said associate editor Bahman Anvari (University of California, Riverside).

"The technique is potentially useful in real-time optoacoustic-based temperature measurements during cryotherapy procedures. The investigators have performed systematic and meticulous studies to validate this temperature measurement approach in tissue-mimicking phantoms."

The team investigated applying an optoacoustic temperature monitoring method for noninvasive real-time thermometry of vascularized tissue during cryotherapy. The universal temperature-dependent optoacoustic response of red blood cells was used to convert reconstructed optoacoustic images to temperature maps, yielding the potential to prevent noncancerous tissue from being destroyed or damaged through careful monitoring of tissue temperatures during cryotherapy procedures.

"Our results provide an important step towards future noninvasive temperature monitoring in live tissues," the authors write.

Lihong Wang, Gene K. Beare Distinguished Professor of Biomedical Engineering at Washington University in St. Louis, is editor-in-chief of the *Journal of Biomedical Optics*. The journal is published in print and digitally in the SPIE Digital Library, which contains more than 458,000 articles from SPIE journals, proceedings, and books, with approximately 18,000 new research papers added each year.

More information: Elena Petrova et al, Imaging technique for real-time temperature monitoring during cryotherapy of lesions, *Journal of Biomedical Optics* (2016). DOI: 10.1117/1.JBO.21.11.116007

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