MRガイド下超音波により乳がんの非侵襲的治療が施行できる（Abstract: SSK02-08）

MRガイド下高度集束超音波により非侵襲的乳がん焼灼が確実に施行できる

MR-guided high intensity focused ultrasound offers reliable ablation of invasive breast cancer

磁器共鳴（MR）ガイド下で集束超音波機器を用いた技術により腫瘍を熱し破壊することにより乳がんが安全かつ有効に治療できるとの研究結果が、Radiological Society of North America（RSNA）年次集会で発表された。MRガイド下集束超音波機器（MRgFUS）アブレーションは高度集束超音波の音響エネルギーを用いて病的組織を焼灼する非侵襲技術である。病変部位の特定およびアブレーション中の温度変化のモニターのためにMRIを継続的に使用する。研究者らは、浸潤性乳管がん患者12人において、がんの外科的切除およびリンパ節生検の前にMRgFUSを施行し、安全性および有効性を評価した。彼らは3T MRIを用いて、がん病変部位が存在し治療可能であることを確認した。その後患者らに単回のMRgFUS治療を施行した。研究者らは術後病理所見により治療の有効性を評価した。施術中または施術直後に有意な合併症を来した患者はいなかった。患者12人中10人においては、施術後に治療領域にMRI上強調される部位は認められなかった。これらの10人の患者においては、術後の組織評価により治療領域に残存病変はないことが確認された。

Full Text

A technique that uses focused ultrasound under magnetic resonance (MR) guidance to heat and destroy tumors may offer a safe and effective treatment for breast cancer, according to research being presented at the annual meeting of the Radiological Society of North America (RSNA).

MR-guided focused ultrasound (MRgFUS) ablation is a noninvasive technique that requires no incision or puncture to perform. Instead, it uses the acoustic energy from high-intensity focused ultrasound to remove, or ablate, diseased tissue. Continuous MRI is used to locate the lesions and monitor the temperature change during the ablation process.

Primary advantages of MRgFUS over other breast cancer treatments are that it is a noninvasive, outpatient procedure offering a quick recovery time, and that it provides precise measurement of temperature changes during the procedure.

"In the treatment stage, we are able to precisely visualize where the energy is having an effect and to measure exactly the rise in temperature," said Alessandro Napoli, M.D., Ph.D., assistant professor of radiology at Sapienza University in Rome. "Temperature monitoring is particularly important, since too low a temperature is ineffective and too high a temperature may be dangerous."

Dr. Napoli and colleagues assessed the safety and efficacy of MRgFUS in 12 patients with invasive ductal breast cancer before surgical removal of the cancer and biopsy of the lymph nodes. They used 3T MRI to confirm the presence and treatable location of cancerous lesions. The patients then underwent single-session MRgFUS treatment. Researchers evaluated treatment efficacy through post-surgery pathology.

None of the patients experienced significant complications during or immediately after the procedure. In 10 of the 12 patients, MRI showed no enhancement in the treatment area after the procedure. Post-surgery histological evaluation confirmed the absence of residual disease in the treatment area in those 10 patients.

"This procedure allows for safe ablation of breast cancer," Dr. Napoli said. "At pathology, no significant viable tumor was found in the specimens from these 10 patients."

In the other two cases, treatment failed due to transducer malfunction, and the pathologist observed residual tumor in the samples.

According to Dr. Napoli, MRI guidance is crucial for correct identification of lesions, treatment planning and real-time control during the procedure. Specifically, monitoring with MRI allows for efficient deposit of energy into the region of treatment at the correct range of between 60 degrees and 70 degrees Celsius (approximately 140 to 158 degrees Fahrenheit).

"This is carried out by a special sequence that is called MR thermometry," Dr. Napoli said. "Only MRI presently has the ability to determine, in real time, fine temperature quantification."

While the initial results are promising, Dr. Napoli said more research will be needed before the approach can be adopted as a stand-alone treatment for breast cancer.
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