IMAGING

Radioactive microspheres—see and destroy

A steady increase in the detection of small renal tumours has been seen in recent years, correlating with the development of more-sensitive, and noninvasive imaging technologies. These tumours frequently occur in elderly patients, for whom surgical resection is often inappropriate. An alternative to partial nephrectomy is intratumoural injection of radioactive microspheres, which has the added feature of allowing direct imaging.

Radioactive holmium acetylacetonate nanoparticles form small (10–15 μm), smooth microspheres. They emit both high-energy β particles and γ rays, and can be used for not only radioablation, but also CT and MRI. Previous studies in tumour-bearing rabbits led by Frank Nijsen, indicated that these particles are stable in treated tissue.

In a new study, the same group injected high holmium content microspheres into orthotopic kidney tumours of BALB/c mice. The treatment had no adverse effects on mouse behaviour, and body weight was unaffected. Single-photon-emission

CT (SPECT) imaging enabled the construction of a radiation dose map, and SPECT combined with the soft-tissue visualization from MRI allowed the evaluation of tumour eradication. There was almost complete tumour control observed in the mice treated with the microspheres, whereas tumours in the control group continued to grow. Although radiation in the tumour reached high levels (an average dose of 323 Gy), damage to the surrounding tissues was minimal.

This method has potential advantages over other therapies for small renal tumours. It supplies prolonged radiation, in contrast to thermal ablation, which requires multiple probes to reach the same dose. Moreover, radioactive microspheres could also be applied to larger tumours or those with irregular shapes, by treating with multiple injections. Although some technical questions still need to be answered and toxicity studies in patients are lacking, preclinical results in rabbits and cats are encouraging.

This study shows that ultrahigh holmium content radioactive particles can be used to efficiently target small renal tumours with radiotherapy, limiting damage to the healthy tissue and enabling continuous monitoring and evaluation of tumour ablation. Although clinical trials are lacking for this intratumoral approach, it has potential as an alternative to surgical treatment of kidney neoplasms.

Magdalena E. Morawska

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