Magnetic nanoparticles deliver chemotherapy to difficult-to-reach spinal tumors

Researchers at the University of Illinois at Chicago have demonstrated that magnetic nanoparticles can be used to ferry chemotherapy drugs into the spinal cord to treat hard-to-reach spinal tumors in an animal model. The unique delivery system represents a novel way to target chemotherapy drugs to spinal cancer cells, which are hard to reach because the drugs must cross the blood-brain barrier.

Spinal cord tumors are a challenge to treat because they are difficult to surgically remove due to their proximity to healthy spinal tissue and because chemotherapy drugs must cross the blood-brain barrier in order to reach them. Intramedullary spinal cord tumors account for 8 percent to 10 percent of all spinal cord tumors and are common among children and adolescents. Average survival for patients with these tumors is 15.5 months.

The researchers, whose results are published in the journal *Scientific Reports*, used a unique rat model with implanted human intramedullary spinal cord tumors to show that magnetic nanoparticles could successfully be used to kill tumor cells.

First, they created nanoparticles made up of tiny, metallic magnets bound to particles of doxorubicin. Next, they implanted a magnet just under the skin covering the spinal vertebrae in the rat models. Then they injected the magnetic nanoparticles into the space around the spinal cord where the tumor was located.

The magnet implanted in close proximity to the tumor guided the nanoparticles to the tumor sites. The researchers were able to show that tumor cells took up the nanoparticles and underwent apoptosis – in other words, they were effectively destroyed. The impact of the nanoparticles on nearby healthy cells was very minimal, Mehta said.

“This proof-of-concept study shows that magnetic nanoparticles are an effective way to deliver chemotherapy to an area of the body that has been difficult to reach with available treatments,” he said. “We will continue to investigate the potential of this therapy and hope to enter human trials if it continues to show promise.”

For more information: DOI: 10.1038/s41598-018-29736-5