P10:102

The Feasibility of Irreversible Electroporation for the Treatment of Bone Tumor

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Background
Irreversible Electroporation (IRE) is short wave of electric pulses can ablate undesirable tissues by generating nanopores on the cell membrane. Cells of the targeted area were ablated while preserve the vital structure like blood vessels and nerves. The non-thermal characteristic of IRE has been shown to exhibit numerous benefits over other traditional ablation technique and has been tested in humans for lung, prostate, kidney, and liver cancers. The effects of IRE are primarily dependent on the local electric field to which the tissue is exposed. Most of the tested tumors are homogeneous, for which the local electric field can be easily predicted. The effect on heterogeneous tissue such as bone tumor remains uncertain. In order to verify the effectiveness of irreversible electroporation's ablation on osteosarcoma, we evaluated the feasibility of IRE against bone tumor both In vitro and in vivo.
Methods
In vitro： The osteosarcoma cell line SOSP-9607 were cultured, collected and then resuspended in normal saline solution was placed in a 4mm gaps parallel aluminum plated Gene Pulser Cuvette. IRE was performed on the cell suspension at voltage of 100 to 1500V, pulse duration of 100 μs. Cell suspension was collected and Cell viability was determined with CCK-8 assay, LDH assay and typan blue stain.
In vivo： We established an osteosarcoma rat model, when the diameter of the tumors reached nearly 1.0 centimeters, IRE was applied to ablate the tumor. Rats were killed immediately, 3 days, and 1 week after IRE. The tumor tissues were processed for gross morphology and histological analysis.
Results and Conclusion
In vitro：IRE can completely destroy osteosarcoma cell SOSP-9607. There was no tumor cell proliferation after continuous incubation 24 hours.
In vivo：Tissue histological examination post-IRE treatment revealed an extensive necrotic area. The sarcoma tumor cells got complete ablation.
In conclusion, our preclinical study shows the feasibility of IRE as a therapeutic modality to treat bone tumors.

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