

Oral presentation

On the pathology of malignant pulmonary tumors after percutaneous radiofrequency ablation

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Aims

Systematic study regarding pathological findings and correlation of the effectiveness of radiofrequency (RF) ablation-treated pulmonary tumors from different primary sites.

Methods

RF ablations of ten pulmonary malignancies in eight patients were performed under computed tomography (CT) guidance. The primary tumors were adenocarcinoma of the lung, rectal and colonic carcinoma, sarcoma, melanoma and adrenocortical carcinoma. Three days after RF ablation, surgical resection was performed followed by pathologic examination. Specimens were evaluated macroscopically and histologically by hematoxylin and eosin (HE) staining, immunohistochemically for cleaved caspase 3 expression, and terminal deoxy-nucleotidyl transferase-mediated nick end-labeling (TUNEL). In addition, electron microscopic investigations were performed. The pathological extent of coagulation was correlated to the helical CT immediately after the ablation procedure.

Results

Pulmonary CT-guided RF ablations were technical successful in all cases. Histology revealed a preserved tissue architecture outside the coagulation zone. A zone of interstitial hemorrhage occurred at the outer boundary of the central zone of coagulation. Some specimens showed tumorous lymphatic spreading outside the RFA zone. On high-power view, despite an irregular homogenization of chromatin, tumor cells showed signs of thermal fixation and characteristics of vital cells especially with mitotic figures. DNA of tumor tissue and the adjacent lung tissue was characterized by double-strand fragmentation as

determined by TUNEL. Ultrastructurally apoptotic bodies were found, indicating apoptotic cells. Immunohistochemistry for active caspase-3 gave no conclusive results. Due to the DNA fragmentation and the results from electron microscopy, the tumor tissue was supposed to be completely ablated in nine cases. The extent and shape of coagulation correlated to so-called ground-glass opacities on postinterventional CT.

Conclusion

In this first systematic study of RF ablation of human pulmonary malignancies, RF proved as a locally effective treatment verified by histology, electron microscopy, immunohistochemistry and molecular studies. However, classic criteria for tissue necrosis were not fulfilled by standard histological staining (HE) especially showing preserved tumor tissue architecture and microscopic cellular details indicating greyzone of tumor regression between apoptosis and necrosis.