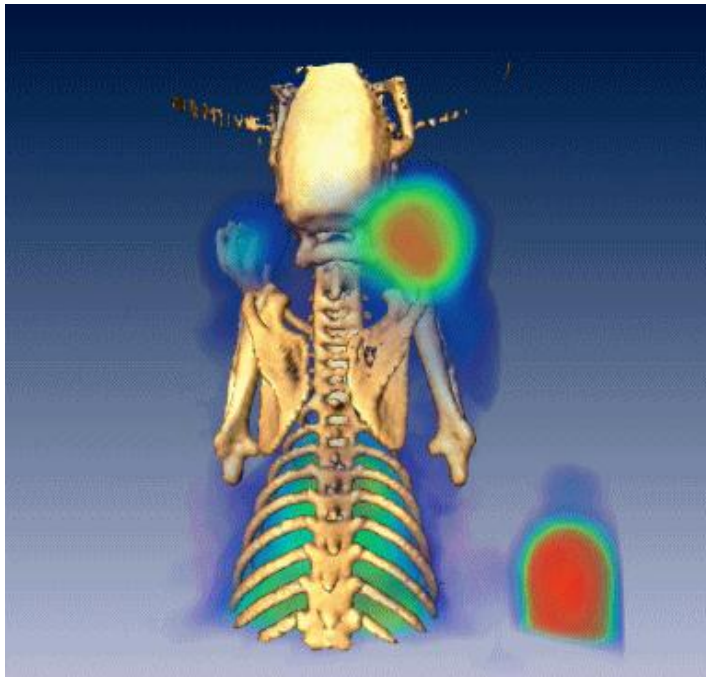


Combination Radiofrequency Ablation and Intravenous Radiolabeled Liposomal Doxorubicin: Imaging and Quantification of Increased Drug Delivery to Tumors¹



Purpose: To identify, with noninvasive imaging, the zone of radiopharmaceutical uptake after combination therapy with radiofrequency (RF) ablation and intravenous administration of technetium 99m (^{99m}Tc) liposomal doxorubicin in a small-animal tumor model, and to quantify and correlate the uptake by using imaging and tissue counting of intratumoral doxorubicin accumulation.

Results: At both SPECT/CT and planar scintigraphy, increased uptake of ^{99m}Tc-liposomal doxorubicin was visibly apparent in the ablated tumors. Results of quantitative analysis with both imaging and tissue counting confirmed significantly greater uptake in the RF ablation-treated tumors ($P < .001$). Intratumoral doxorubicin accumulation correlated closely with imaging ($r = 0.9185$ – 0.9871) and tissue-counting ($r = 0.995$) results.

Conclusion: Study results show that increased delivery of intravenous liposomal doxorubicin to tumors combined with RF ablation can be depicted and quantified with noninvasive imaging.

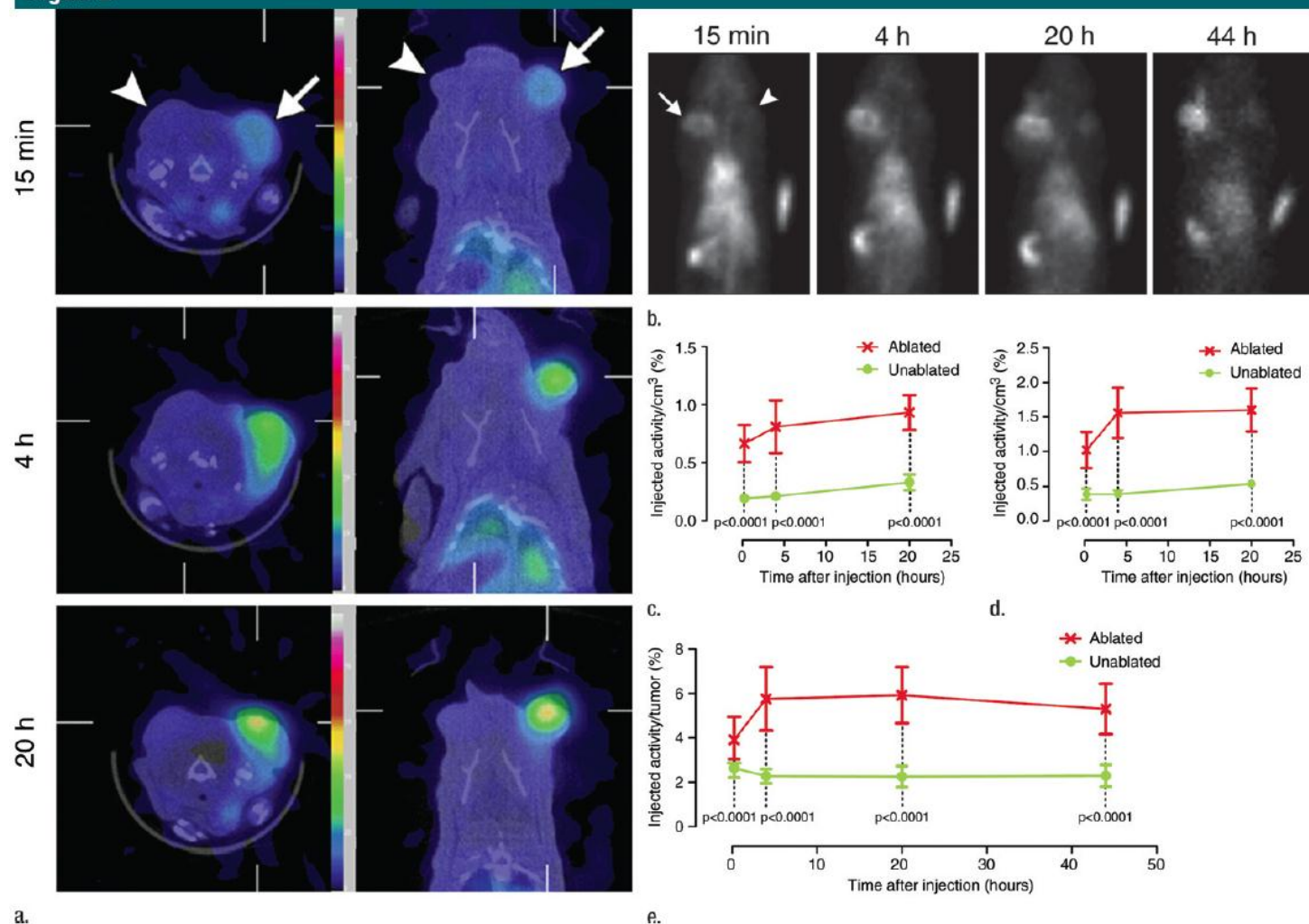
Figure 2

Figure 2: Increased uptake of ^{99m}Tc-liposomal doxorubicin in RF-ablated tumors. **(a)** Transaxial (left) and coronal (right) SPECT/CT images acquired at three time points after intravenous administration of ^{99m}Tc-liposomal doxorubicin in rat with two tumors. Right tumor (arrows) was also treated with RF ablation. Left tumor (arrowheads) was not ablated. Color map represents SPECT pixel values from 0 to an arbitrary maximal value of 100, indicating percent relative ^{99m}Tc activity. **(b)** Posterior scintigraphic images acquired at four time points after intravenous administration of ^{99m}Tc-liposomal doxorubicin in different rat with two tumors. Left tumor (arrow) was also treated with RF ablation. Right tumor (arrowhead) was not ablated. **(c)** Graph illustrates percentages of injected ^{99m}Tc activity per cubic centimeter of tumor tissue at three time points, as determined at SPECT/CT analysis of single tumors in seven rats treated with combined RF ablation-intravenous ^{99m}Tc-liposomal doxorubicin and three rats treated with intravenous ^{99m}Tc-liposomal doxorubicin only. **(d)** Graph illustrates percentages of injected ^{99m}Tc activity per cubic centimeter of tumor tissue at three time points, as determined at SPECT/CT analysis of rats with two tumors each, one of which was treated with RF ablation after intravenous ^{99m}Tc-liposomal doxorubicin. **(e)** Graph illustrates percentages of injected ^{99m}Tc activity per whole tumor at four time points, as determined at scintigraphic analysis of rats with two tumors each, one of which was treated with RF ablation after intravenous ^{99m}Tc-liposomal doxorubicin. In c-e, center points indicate means and error bars indicate 95% confidence intervals. P values were calculated at two-way ANOVA after logarithmic transformation of raw data.