Abstract:
To evaluate the effects of combined use of transarterial chemoembolization and irreversible electroporation (IRE) for focal tissue ablation in an acute porcine liver model. Two established interventional techniques were combined: IRE with zones of irreversible and reversible electroporation and chemoembolization with microspheres, iodized oil, and doxorubicin. IRE was performed before chemoembolization in two pigs (pigs 1 and 2; IRE/chemoembolization group), chemoembolization was performed before IRE in two pigs (pigs 3 and 4; chemoembolization/IRE group), and only IRE was performed in two pigs (pigs 5 and 6). Five study groups were defined: IRE/chemoembolization (pigs 1 and 2), chemoembolization/IRE (pigs 3 and 4), IRE only (pigs 5 and 6), chemoembolization only (tissue outside the IRE zones in pigs 1-4), and control (untreated liver tissue outside the IRE zones in pigs 5 and 6). Animals were euthanized 2 hours after intervention. Size and shape of IRE zones on contrast-enhanced computed tomography, cell death on light microscopy, and doxorubicin tissue concentrations on chromatography and fluorescence microscopy were analyzed. Size and
shape of IRE zones were not significantly different (e.g., \( P = .067 \) for volume). A histologic marker for irreversible cell death was positive in IRE/chemoembolization, chemoembolization/IRE, and IRE groups only in the macroscopically visible IRE zones. Doxorubicin tissue concentrations were not significantly different (\( P = .873 \)). However, in the reversible electroporation (RE) zones, broad areas with intense intranuclear doxorubicin accumulation were observed in IRE/chemoembolization but not in chemoembolization/IRE and chemoembolization groups. IRE before chemoembolization enhances the intranuclear accumulation of doxorubicin in the RE zone.