To prospectively evaluate an elastin-specific MR contrast agent (ESMA) for in vivo targeting of elastic fibers in myocardial infarction (MI) and postinfarction scar remodeling, MI was induced in C57BL/6J mice (n=40) by permanent ligation of the left anterior descending coronary artery. MRI was performed at 7 and 21 days after MI. The merits of gadolinium-based ESMA (Gd-ESMA) were compared with gadopentetic acid (Gd-DTPA) for infarct size determination, contrast-to-noise ratio (CNR), and enhancement kinetics. Specific binding in vivo was evaluated by blocking the molecular target using nonparamagnetic lanthanum-ESMA. In vivo imaging results were confirmed by postmortem triphenyltetrazolium chloride staining, elastica van Gieson staining, and Western blotting. Delayed enhancement MRI revealed prolonged enhancement of Gd-ESMA in the postischemic scar compared with Gd-DTPA. Infarct size measurements showed good agreement between Gd-ESMA and Gd-DTPA and were confirmed by ex vivo triphenyltetrazolium chloride staining. Preinjection of the blocking lanthanum-ESMA resulted in significantly lower CNR of Gd-ESMA at the infarct site (P=0.0019). Although no significant differences in CNR were observed between delayed enhancement imaging and Gd-DTPA.
between days 7 and 21 (1.8± versus 3.8; P=ns), Gd-ESMA showed markedly higher CNR on day 21 after MI (14.1 versus 4.9; P=0.0032), which correlated with increased synthesis of tropoelastin detected by Western blot analysis and histology. Higher CNR values for Gd-ESMA further correlated with improved ejection fraction of the mice on day 21 after MI. Gd-ESMA enables targeting of elastin within the infarct scar in a mouse model of MI. The imaging properties of Gd-ESMA allow quantification of intrascar elastin content in vivo and thereby provide potential for noninvasive characterization of postinfarction scar remodeling.