Abstract:
Angiogenesis is a critical feature of plaque development in atherosclerosis and might play a key role in both the initiation and later rupture of plaques. The precursory molecular or cellular pro-angiogenic events that initiate plaque growth and that ultimately contribute to plaque instability, however, cannot be detected directly with any current diagnostic modality. This study was designed to investigate the feasibility of ultrasound molecular imaging of endothelial \(\beta_3\) expression in vitro and in vivo using \(\beta_3\)-targeted ultrasound contrast agents (UCAs). In the in vitro study, \(\beta_3\) expression was confirmed by immunofluorescence in a murine endothelial cell line and detected using the targeted UCA and ultrasound imaging at 18-MHz transmit frequency. In the in vivo study, expression of endothelial \(\beta_3\) integrin in murine carotid artery vessels and microvessels of the salivary gland was quantified using targeted UCA and high-frequency ultrasound in seven animals. Our results indicated that endothelial \(\beta_3\) expression was significantly higher in the carotid arterial wall containing atherosclerotic lesions than in arterial segments without any lesions. We also found that the salivary gland can...
be used as an internal positive control for successful binding of targeted UCA to ?v?3 integrin. In conclusion, ?v?3-targeted UCA allows non-invasive assessment of the expression levels of ?v?3 on the vascular endothelium and may provide potential insights into early atherosclerotic plaque detection and treatment monitoring.