Our objective was to explore the potential role tissue anisotropy may have in the quantitative assessment of myocardial perfusion using ultrasonic contrast agents. As an approach, we employed a computer simulation of the parasternal short-axis view of the heart, based on previously measured (in vitro) values for the anisotropy of backscatter and attenuation of myocardium, to predict the backscattered ultrasonic energy from 18 specific regions within the heart before and after myocardial contrast perfusion. We investigated a series of specific combinations of anisotropic tissue properties with isotropic contrast properties and compared the predicted backscatter values before and after myocardial contrast perfusion. Results of the simulation indicate that the potential effects of myocardial anisotropy on quantitative assessment of myocardial perfusion can be substantial. For example, specific combinations of tissue and contrast properties can result in a relatively large increase in backscatter with contrast perfusion for regions of myocardium where the angle of insonification between the incident ultrasonic beam and the local myofiber orientation is primarily perpendicular with a paradoxical decrease in backscatter with contrast perfusion in regions of myocardium where the angle of insonification is primarily parallel. These results suggest that quantitative assessment of myocardial perfusion with contrast echocardiography may be influenced by the anisotropic properties of the myocardium and the degree of myocardial enhancement due to the presence of contrast may depend upon the specific region investigated. [NIH Grants HL40302 and HL53461]