Two-dimensional numerical simulations of wall-bounded turbulent pulsating flow driven by a sinusoidal velocity through a circular smooth tube are carried out. These computations for a Womersley number a ranged from 0.7 to 2069 and a dimensionless frequency $x^þ$ ranged from 1:2 10^{-5} to 33.5. The aim of this study is to calculate the phase lag inside the unsteady turbulent boundary layer and across the tube. The phase lag of the velocity and shear stress with respect to the pressure gradient is deduced. Also, the instantaneous logarithmic layer and the turbulent parameters are analyzed. It is found that capturing the phase lag near the wall depends on resolving the Stokes layer thickness d_{st}. At ultrahigh frequencies, the centerline velocity was delayed from the pressure gradient and wall shear stress by 45 deg and 90 deg, respectively. Consequently, the velocity and shear stress lagged behind the pressure gradient by 90 deg and 280 deg at the core of the tube, respectively, and by 45 deg at the wall. Thus, the trend of the radial phase lag increases toward the tubes center for $x^þ$ > 0:06, which contrasts with that at low frequencies. When a reversed flow is caused by increasing the amplitude of the imposed oscillations, the phase lag is not affected noticeably by this increment. The radial phase lag is kept constant outside the oscillatory boundary layer at high frequencies because the radial gradient of the axial velocity has vanished.