In this paper, lightning-induced voltages on multiconductor lines with surge arresters and pole transformers have been computed using the 3-D finite-difference time-domain method. This method uses a sub grid model, in which spatial discretization is fine (cell side length is 0.5 m) in the vicinity of overhead wires and coarse (cell side length is 5 m) in the rest of the computational domain. In the simulations, four-conductor lines with surge arresters and pole transformers are considered. The 1-cm-radius overhead conductors are represented by placing a wire having an equivalent radius of about 0.12 m (≈ 0.23 × 0.5 m) in the center of an artificial rectangular prism having a cross-sectional area of 1 m × 1 m (2 cells × 2 cells) and the modified (relative to air) constitutive parameters: lower electric permittivity and higher magnetic permeability. The computed lightning-induced voltage waveforms agree reasonably well with the corresponding ones measured in the small-scale experiment of Piantini et al. (2007).