The interesting physics related to displacement phenomenon of a viscous fluid by a less viscous one inside a porous material has been the subject of intensive research in the past and in recent years, in particular due to its close connections with hydrology and oil recovery. Only a few studies have been devoted to the investigation of the displacement process through percolation porous media at criticality. Previous numerical simulations with two-dimensional diluted percolation lattices have shown that, although the clusters generated from VF and DLA have the same fractal dimension at the vicinity of the critical point, many other geometrical differences can be observed between these two processes. In a recent study [1], the dynamics of viscous displacement through percolation porous media has been investigated in the limiting condition of unitary viscosity ratio, $m \equiv \mu_2/\mu_1 = 1$, where $\mu_1$ and $\mu_2$ are the viscosities of the injected and displaced fluids, respectively. In the present study, we investigate the dynamics of viscous penetration in two-dimensional percolation networks at criticality for the case in which the ratio between the viscosities of displaced and injected fluids is very large $m \to \infty$. Our results based on extensive numerical simulations indicate that the scaling exponents for the breakthrough time distribution are the same as the previously reported values computed for the case of unitary viscosity ratio. We thus suggest that the process of viscous displacement through critical percolation networks might constitute a single class of universality independent of the viscosity ratios.