Millions of people worldwide suffer from debilitating, progressive, and often permanent loss of vision without any viable treatment options. The complex physiological barriers of the eye contribute to the difficulty in developing novel therapies by limiting our ability to deliver therapeutics in a sustained and controlled manner; especially when attempting to deliver drugs to the posterior eye or trying to regenerate the diseased retina. Cell-based therapies offer a significant potential advancement in these situations. In particular, encapsulating, or immunoisolating, cells within implantable, semi-permeable membranes has emerged as a clinically viable means of delivering therapeutic molecules to the eye for indefinite periods of time. The optimization of encapsulation device designs is occurring together with refinements in biomaterials, genetic engineering, and stem-cell production, yielding, for the first time, the possibility of widespread therapeutic use of this technology. Here, we highlight the status of the most advanced and widely explored iteration of cell encapsulation with an eye toward translating the potential of this technological approach to the medical reality.