

Nanoemulsion-based parenteral drug delivery system of carbamazepine: preparation, characterization, stability evaluation and blood-brain pharmacokinetics

ABSTRACT

Carbamazepine (CBZ) was encapsulated in a parenteral oil-in-water nanoemulsion, in an attempt to improve its bioavailability. The particle size, polydispersity index and zeta potential were measured using dynamic light scattering. Other parameters such as pH, osmolality, viscosity, drug loading efficiency and entrapment efficiency were also recorded. Transmission electron microscopy revealed that emulsion droplets were almost spherical in shape and in the nano-range. The in vitro release profile was best characterized by Higuchi's equation. The parenteral nanoemulsion of CBZ showed significantly higher $AUC_{0 \rightarrow 5}$, $AUC_{0 \rightarrow \infty}$, $AUMC_{0 \rightarrow 5}$, $AUMC_{0 \rightarrow \infty}$, C_{max} and lower clearance than that of CBZ solution in plasma. Additionally, parenteral nanoemulsion of CBZ showed significantly higher $AUC_{0 \rightarrow \infty}$, $AUMC_{0 \rightarrow \infty}$ and C_{max} than that of CBZ solution in brain. The parenteral nanoemulsion of CBZ could therefore use as a carrier, worth exploring further for brain targeting.

Keyword: Carbamazepine; Nanoemulsion; Viscosity; Drug

