In this paper, we investigate a logic called connexive Heyting-Brouwer logic or bi-intuitionistic connexive logic, BCL. The system BCL is introduced as a Gentzen-type sequent calculus, and we prove some theorems for embedding BCL into a Gentzen-type sequent calculus BL for bi-intuitionistic logic, BiInt. The completeness theorem with respect to a Kripke semantics for BCL is proved using these embedding theorems. The cut-elimination theorem and a certain duality principle are also shown for some subsystems of BCL. Moreover, we present a sound and complete triply-signed tableau calculus for BCL.