

**PURPOSE:** Mortality rates for the separation of craniopagus twins remain in excess of 50%. A 15-year review of all reported patients with craniopagus was performed. To identify guidelines as to which sets of twins are most conducive to successful separation

**METHODS:** All reported cases of craniopagus twin separation attempts from 1995 to 2010 were identified using PubMed ( $N_{\text{twins}}=15$ ). A categorical database was developed containing information on each twin pair including sex, date of birth, date of surgery, multiple vs. single stage surgery, angular vs. vertical conjoining, nature of shared cerebral venous system, and the presence of other comorbidities identified as cardiovascular, genitourinary, and craniofacial. The data were analyzed using Fisher's Exact Test for univariate comparisons when data values were identical within twin pairs. A non-linear mixed effects regression model with a random effect for intra-pair correlation was used when values were different for each pair.

**RESULTS:** Ten of the fifteen twin pairs were successfully separated, defined as both twins surviving to at least postoperative day thirty. The remaining five pairs had mixed outcomes including one pair with two deaths, two pairs with one death each, and two pairs deemed inseparable following initial attempts. The latter two twin pairs were categorized with "unsuccessful separation." Only two variables were statistically significant for successful separation: 1) the presence of vertical craniopagus (p-value  $<0.001$ ); 2) the absence of genitourinary anomalies (p-value = 0.017, odds ratio 0.11). No statistical significance was attributed to the nature of the shared cerebral venous drainage (p-value 0.29) or the other variables examined.

**CONCLUSIONS:** Vertical craniopagus twins and twins without genitourinary abnormalities have the highest likelihood of successful separation. Factors possibly associated with successful separation include surgery at a young age and the use of staged separations. Improved outcomes in vertical craniopagus can be attributed to the nature of the shared venous drainage; however, both circumferential shared sinus and shared superior sagittal sinus drainage shared an equal association with successful separation (p-value of 0.29). Magnitude of risk must consider the number of organ systems shared and the resultant physiologic dependence between the twins. The decision to proceed with separation of craniopagus twins must be multi-disciplinary, requiring administrative and financial support, a comprehensive medical team, bioethical considerations, and the family's comprehension of the involved risk.