Childhood Hydrocephalus Treated By Endoscopic Third Ventriculostomy: Technique, Results And Outcome

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Abstract

Endoscopic ventriculocisternostomy (ETV) is currently the treatment of choice for various forms of hydrocephalus. It consists of a stoma on the floor of the 3rd ventricule restoring the circulation of CSF. This technique has demonstrated its effectiveness even in non-obstructive forms of hydrocephalus. According to several papers, surgical results and long-term outcome in pediatric population depends on many factors such as age, etiology, and physiopathology of hydrocephalus.

Better outcome is observed in congenital aqueductal stenosis However, controversies still exist whether ETV is effective and superior to shunt placement in younger pediatric patients. Long-term follow-up is mandatory. In Uganda, childhood hydrocephalus is common and difficult to treat. In some children, endoscopic third ventriculostomy (ETV) can be successful and avoid dependence on a shunt. This can be especially beneficial in Uganda, because of the high risk of infection and long-term failure associated with shunting. Therefore, the authors developed and validated a model to predict the chances of ETV success, taking into account the unique characteristics of a large sub-Saharan African population.

All children presenting with hydrocephalus at CURE Children's Hospital of Uganda (CCHU) between 2001 and 2007 were offered ETV as first-line treatment and were prospectively followed up. A multivariable logistic regression model was built using ETV success at 6 months as the outcome. The model was derived on 70% of the sample (training set) and validated on the remaining 30% (validation set). Endoscopic third ventriculostomy was attempted in 1406 patients. Of these, 427 were lost to follow-up prior to 6 months. In the remaining 979 patients, the ETV was aborted in 281 due to poor anatomy/visibility and in 310 the ETV failed during the first 6 months. Therefore, a total of 388 of 979 (39.6% and [55.6% of completed ETVs]) procedures were successful at 6 months. The mean age at ETV was 12.6 months, and 57.8% of cases were postinfectious in origin. The authors' logistic regression model contained the following significant variables: patient age at ETV, cause of hydrocephalus, and whether choroid plexus cauterization was performed. In the training set (676 patients) and validation set (303 patients), the model was able to accurately predict the probability of successful ETV (Hosmer-Lemeshow p value > 0.60 and C statistic > 0.70). The authors developed the simplified CCHU ETV Success Score that can be used in the field to predict the probability of ETV success.

The authors' model will allow clinicians to accurately identify children with a good chance of successful outcome with ETV, taking into account the unique characteristics and circumstances of the Ugandan population. Of the 42 pediatric patients, we were successful in 29 children in whom the V-P drainage was removed with no need of further V-P drainage introduction or any other surgery for hydrocephalus 1 year from ETV, and thus the overall success rate was 69%. We were most successful in patients with congenital aqueductal stenosis (12 of 15 patients, 80%); the worst results were obtained in the group of patients with postinfectious hydrocephalus (4 successful of 7 patients, 57%). In the group of 9 patients who had already underwent ETV in infant or neonatal period, the success rate 56% has been achieved (5 successful of 9 patients). Most of these patients suffered from posthemorrhagic obstructive hydrocephalus. Overall, we were unsuccessful in 13 children (31%). In 3 patients operated on for V-P drainage dysfunction, the drainage function had to be restored from 10 to 48 hours after ETV by replacing the dysfunctional part of drainage catether due to ETV dysfunction. In 6 children with planned ETV, we performed V-P drainage revision and functional restoration from 2 to 7 days after ETV.

In 2 cases, we were forced to remove the drainage clip 8 and 20 hours, respectively, from ETV under local anesthesia. In 1 patient, the V-P drainage had to be reinserted after three weeks and in 1 patient after three months from the ETV. This patient had no clinical symptoms of intracranial hypertension, but missed MRI flow void phenomenon and ventricular system enlargement implicated V-P drainage restoration. There were 2 serious complications in our group of patients. Acute ETV failure developed in 1 patient after 1 year from ETV and in 1 patient after 2.5 years from V-P drainage removal. Clinical course was very similar in both ETV failure cases presenting a brief episode of weakness followed by sudden unconsciousness with bilateral mydriasis and respiratory failure. CT revealed acute hydrocephalus, and therefore acute external ventricular drainage was performed in both patients.

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