
Early diagnosis of the failure of endoscopic third ventriculostomy

Aim of the study:

The aim of the study is to determine the risk of ETV failure based on the presence or absence of radiological indications of third chamber deformation (bowing of the third chamber) on preoperative MR brain scans in patients with obstructive hydrocephalus. Additionally evaluating extend of the bowing, patients age, regression of bowing following successful ETV, etiology, degree of prematurity of newborns, persistence and character of clinical symptoms and other factors.

Type of the study:

Prospective clinical study.

The data set and methodology:

Data set comprised 157 patients with obstructive hydrocephalus operated on Neurosurgical clinic of University Hospital Ostrava between January 2008 and December 2016. The follow up duration was at least 3 months. From this cohort we were able to determine effect of bowing on ETV outcome in 135 patients. Of these patients, 70 were adults, 27 were children between 7 months and 16 years of age and 38 were infants under 6 months. From 38 infants under 6 months were 22 severe premature newborns, 9 moderately premature newborns and 7 mildly premature newborns. The extend of the bowing was determine in the range 3 – 14 mm.

Results:

ETV was noted as successful in 84 cases (62%). Statistical analysis confirmed that bowing was significantly connected with ETV success in patients older than 6 months ($p = 0,0005$), including children than 7 months ($p = 0,001$). In these patients with bowing ETV was significantly more successful with an approximately six timer lower risk of failure. Conversely, a connection between bowing and ETV success was not found in infants up to 6 months ($p=1,000$). No link was found between the extend of bowing and ETV success in the groups older than 6 months ($p=0,559$) and younger

($p=0,786$). There is statistically higher risk of failure in patients younger than 6 months ($p=0,002$). Bowing regression is connected with ETV success as observed in 96% ($p=0,0005$). No link was observed between bowing and gender. Bowing was statistically more frequent in severely premature patients ($p=0,049$). However, prematurity does not effect rate of ETV success ($p = 0,262$). Connection was confirmed between ETV failure and patients, both adult and children, with intracranial hemorrhage ($p < 0,0005$). Neurological infection was determined not to be a factor in ETV failure ($p=1,000$). Individual differences in hydrocephalus etiology did not effect ETV outcome ($p=0,527$). Just us no connection was found between character and duration of symptoms and ETV success rate. Average follow up duration was 4.3 years, 76% of patients were followed more than 2 years. ETV failure occurred in 90% of cases within three months and only in 3.4% cases more than one year after surgery. Statistically, failure is most likely to occur within 3 months of ETV ($p=0,0005$).

Conclusion:

Our group of 135 patients is the largest published group dealing with the influence of third ventricle bowing on the success of ETV and, at the same time, first study examining this relationship in pediatric patients less than 6 months of age. We have shown a significant connection between the presence of bowing and ETV success in adult and pediatric patients over 6 months of age. Bowing in these patients can predict a significantly higher success rate and lower risk of ETV failure early on by pre-operative MR brain scans. Conversely, in children less than 6 months, this relationship was not confirmed and bowing is not recommended for use in this patient group as one of the ETV indication criteria. The success of ETV does not affect the size of bowing, but only its presence. At the same time, we found that bowing regression correlated with the success of ETV. Except patients with bowing absences, we found that patients with post-haemorrhagic hydrocephalus and children under 6 months had a higher risk of ETV failure.