Electromagnetic guided ventricular catheter placement

Idiopathic intracranial hypertension (IIH) is characterized by increased cerebrospinal fluid pressure and normal or slit ventricles. Lumboperitoneal shunting had been favored by many investigators for CSF diversion in IIH for decades; however, it has been associated with various side effects. Because of the small ventricular size adequate positioning of a ventricular catheter is challenging.

Case series

2017

Twenty patients with hydrocephalus requiring VP shunt were prospectively included in this study. Patients were divided into two groups; the ventricular catheter was positioned using free-hand method (n=10) or magnetic navigation system (n=10). For the two groups, clinical baseline characteristics, etiology of hydrocephaly and initial ventricular size were assessed. The main judgment criterion was the proportion of optimal catheter placements defined by the presence of all catheter holes in the ventricle, evaluated on post-operative CT scan.

There was no initial difference between the two groups in terms of hydrocephalus etiology or initial ventricular size. The number of optimal catheter placements was 6/10 in the neuronavigated group versus 1/10 in the free-hand group ($p<0.05$). There were no complications during post-operative period in either cohort.

In patients suffering from hydrocephaly, the use of an electromagnetic neuronavigation system for ventricular catheter placement significantly improved the proportion of optimal catheter placements. Long-term follow-up is necessary to evaluate the number of revision surgeries and the cost in each group [1].

Hermann et al., investigated the usefulness of electromagnetic guided ventricular catheter placement for ventriculoperitoneal shunting in IIH.

Eighteen patients with IIH were included in this study. The age of patients ranged from 5 to 58 years at the time of surgery (mean age: 31.8 years; median: 29 years). There were 2 children (5 and 11 years old) and 16 adults. Inclusion criteria for the study were an established clinical diagnosis of IIH, lack of improvement with medication, and the presence of small ventricles. In all patients EM-navigated placement of the ventricular catheter was performed using real-time tracking of the catheter tip for exact positioning close to the foramen of Monro. Postoperative CT scans were correlated with intraoperative screen shots to validate the position of the catheter.

In all patients EM-navigated ventricular catheter placement was achieved with a single pass. There were no intraoperative or postoperative complications. Postoperative imaging confirmed satisfactory positioning of the ventricular catheter. No proximal shunt failure was observed during the follow-up at a mean of 41.5 months (range: 7-90 months, median: 40.5 months).

EM-navigated ventricular catheter placement in shunting for IIH is a safe and straightforward technique. It obviates the need for sharp head fixation, the head of the patient can be moved during

surgery, and it may reduce the revision rate during follow-up [2].

1)

Gilard V, Magne N, Gerardin E, Curey S, Pelletier V, Hannequin P, Derrey S. Comparison of electromagnetic neuronavigation system and free-hand method for ventricular catheter placement in internal shunt. Clin Neurol Neurosurg. 2017 Jul;158:93-97. doi: 10.1016/j.clineuro.2017.05.007. Epub 2017 May 8. PubMed PMID: 28500927.

2)

Hermann EJ, Polemikos M, Heissler HE, Krauss JK. Shunt Surgery in Idiopathic Intracranial Hypertension Aided by Electromagnetic Navigation. Stereotact Funct Neurosurg. 2017 Jan 14;95(1):26-33. doi: 10.1159/000453277. [Epub ahead of print] PubMed PMID: 28088808.