External ventricular drainage height management

The nurse adjusts the height of the EVD such that its pressure transducer is in line with the Foramen of Monro, which falls at the level of the external auditory meatus of the ear in the supine position and at the mid-sagittal line (between the eyebrows) in the lateral position. Tools such as a Carpenter's level or laser leveling device are used to zero the drain at this level and assure the accuracy of placement, as leveling based on visual checks alone is often inaccurate. Next, the drip chamber is adjusted to the desired height level, before unclamping the chamber. At this prescribed height, CSF will drain whenever the interventricular pressure exceeds that set by the height of the collection system. Flow ceases once the pressure equalizes between the CSF compartments in the brain and the collection system. As a result, the collection system must be re-leveled whenever the patient changes position to avoid erroneous ICP reading and/or over or under drainage. [1].

Intracranial pressure tracing should be inspected after the collecting system is appropriately leveled. If an EVD is open with continuous drainage, the stopcock at the level of the transducer should be turned “off” to the drain and “open” to the transducer in order to obtain an ICP reading. [2].

The ICP waveform generally takes 30 s or so to stabilize, and should appear pulsatile. An ICP wave is comprised of three separate peaks, decreasing in height under normal conditions to correlate with the arterial pressure waveform occurring with each cardiac cycle [3] [4].

In patients with intracranial hypertension or failing intracranial compliance, the amplitude of all three peaks may increase, followed by elevation of the second peak over the first, with possible complete disappearance of the first peak within the wave [5] [6].

External ventricular drainage placement (EVD) is widely practiced in neurosurgery for various diseases and conditions accompanied by impaired cerebrospinal fluid (CSF) circulation, intracranial hypertension (ICHyp), intraventricular hemorrhage (IVH), and hydrocephalus. Specialists have been using this method in patients with acute aneurysmal subarachnoid hemorrhage (aSAH) for more than 50 years. Extensive experience gained at the Burdenko Neurosurgical Center (BNC) in Moscow, the Russian Federation, in the surgical treatment of patients with acute aSAH enabled us to describe the results of using an EVD in patients after microsurgery. The objective of the research was to assess the effectiveness and safety of the EVD and clarify the indications for the microsurgical treatment of aneurysms in patients with acute SAH. Materials and methods From 2006 until the end of 2018, 645 patients registered in the BNC database underwent microsurgery for acute (0-21 days) aSAH. During the case study, we assessed the severity of hemorrhage according to the Fisher scale, the condition of patients on the Hunt-Hess (H-H) scale during surgery, the time of placement of EVD (before, during, and after surgery), and the duration of EVD. The number of patients with parenchymal intracranial pressure (ICP) transducers was assessed by the degree of correlation of ICP data through the EVD and parenchymal ICP transducer. One of the aims of the research was to compare the frequency of using EVD and decompressive craniectomy (DCH). The incidence of EVD-associated meningitis was analyzed. The need for a ventriculoperitoneal shunt (VPS) in patients after using EVD was also assessed. Overall outcomes were assessed using a modified Rankin scale (mRS) at the time of patient discharge. Exclusion criteria were as follows: patients aged less than 18 years and the lack of assessed data. Patients undergoing endovascular and conservative treatments also were excluded.

Results Among the patients enrolled in the study, 22% (n=142) had EVD. Among these, 99 cases (69.7%) had EVD installed in the operating room just before the start of the surgical intervention. In some cases, ventriculostomy was performed on a delayed basis (16.3%). A satisfactory outcome (mRS scores of 1 and 2) was observed in 24.7% (n=35). Moderate and profound disability at the time of discharge was noted in 55.7% (n=79). Vegetative outcome at discharge was noted in 8.4% (n=12), and mortality occurred in 12.3% (n=15). Conclusion EVD ensures effective monitoring and reduction of ICP. EVD is associated with a relatively low risk of infectious, liquorodynamic, and hemorrhagic complications and does not worsen outcomes when used in patients with aSAH. We propose that all patients in the acute stage of SAH with H-H severity of III-V should receive EVD immediately before surgery [7)]

1)

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