Obstructive hydrocephalus from posterior fossa tumor risk factors

Saad et al. from the Emory University Hospital surveyed the CNS (Central Nervous System) Tumor Outcomes Registry at Emory (CTORE) for patients who underwent posterior fossa tumor surgery at 3 tertiary-care centers between 2006 and 2019. Demographic, radiographic, perioperative, and dispositional data were analyzed using univariate and multivariate models.

They included 617 patients undergoing PFT resection for intra-axial (57%) or extra-axial (43%) lesions. Gross total resection was achieved in 62% of resections. Approximately 13% of patients required permanent cerebrospinal fluid shunt. Only 31.5% of patients who required pre- or intraop external ventricular drain (EVD) placement needed permanent cerebrospinal fluid shunt. On logistic regression, Tumor size, transependymal edema, use of perioperative external ventricular drain, postoperative intraventricular hemorrhage (IVH), and surgical complications were predictors of permanent CSF diversion. Preoperative tumor size was the only independent predictor of postoperative shunting in patients with subtotal resection. In patients with intra-axial tumors, transependymal flow (P = .014), postoperative IVH (P = .001), surgical complications (P = .013), and extent of resection (P = .03) predicted need for shunting. In extra-axial tumors, surgical complications were the major predictor (P = .022).

The study demonstrates that the presence of preoperative hydrocephalus in patients with PFT does not necessarily entail the need for permanent CSF diversion. Saad et al. reported the major predictive factors for needing a permanent cerebrospinal fluid shunt for obstructive hydrocephalus [1].

Superior tumor extension (into the aqueduct) and failed total resection of tumor were identified as independent risk factors for postoperative hydrocephalus in patients with fourth ventricle tumor [2].

Cully and colleagues analyzed 117 patients and found the following factors to be associated with a higher incidence of postresection hydrocephalus (PRH): age <3 years, midline tumor location, subtotal resection, prolonged EVD requirement, cadaveric dural grafts, pseudomeningocele formation, and CSF infections [3].

Due-Tonnessen and Hleseth found that patients with medulloblastoma and ependymoma had much higher rates of postoperative shunt placement than astrocytomas [4]. Kumar and colleagues in a study of 196 consecutive children found age <3 years, tumor histology of medulloblastoma/ependymoma and partial resections were associated with the increased chances of postresection hydrocephalus [5]. A study noted that the only modifiable risk factor for the development of PRH was the presence of intraventricular blood in postoperative imaging [6].

Intraventricular blood can cause hydrocephalus either by the “snow globe effect” [7] or by other factors like impaired absorption of CSF by inflammation and fibrosis of the arachnoid granulations caused by blood degradation products [8].

Gopalakrishnan and colleagues noted the following risk factors for PRH: the need for CSF diversion in the pediatric population—children with symptomatology <3 months duration, severe hydrocephalus

at presentation, tumor location in the midline, tumor histology, viz. medulloblastoma and ependymoma, use of intraoperative EVD, longer duration of EVD, postoperative meningitis, and pseudomeningocele [9]. Similar findings were also reported by Bognar et al. who showed that the presence of EVD and the duration of EVD were associated with a significant increase in the incidence of postresection CSF diversion. In another recent study, Pitsika et al. [10] showed that patients who underwent EVD had a higher rate of postoperative VPS. They also noted a negative correlation between early EVD clamping and VPS indicating that clamping encourages the re-establishment of normal CSF flow when the obstructive tumor is removed [11]. From [12].

Choroid plexus cysts (CPCs) are a type of neuroepithelial cysts, benign lesions located more frequently in the supratentorial compartment. Symptomatic CPCs in the posterior fossa are extremely rare and can be associated with obstructive hydrocephalus.

Systematic Review

Predictive factors for postoperative hydrocephalus has been identified, including young age (< 3 years), severe symptomatic hydrocephalus at presentation, EVD placement before surgery, FOHR index > 0.46 and Evans index > 0.4, pseudomeningocele, cerebrospinal fluid fistula, and infection. The use of a pre-resection cerebrospinal fluid shunt in case of signs and symptoms of hydrocephalus is mandatory, although it resolves in the majority of cases. As reported by several studies included in the present review, we suggest CSF shunt also in case of asymptomatic hydrocephalus, whereas it is not indicated without evidence of ventricular dilatation [13].

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