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Intraoperative precautionary insertion of external ventricular drainage catheters in posterior fossa tumors presenting with hydrocephalus

Hosam A.M. Habib *

Department of Neurosurgery, Menoufia University, Egypt

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KEYWORDS

Posterior fossa tumors;
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Abstract *Introduction:* Hydrocephalus in association of posterior cranial fossa tumors (PFT) remains a matter of controversy; whether to perform cerebrospinal fluid (CSF) diversion prior to tumor resection, or to perform direct tumor resection.
Objective: The aim of this study is to assess the risks and benefits associated with routine intraoperative insertion of external ventricular drainage (EVD) catheters in patients with PFT presenting with hydrocephalus.
Methods: Forty two patients with PFT with secondary hydrocephalus had intraoperative insertion of an external ventricular drainage catheter, it was kept closed, unless intraoperative lowering of the intracranial tension was needed, or opened postoperatively in cases of persistent hydrocephalus, CSF leak, in certain cases throughout and after the procedure.
Results: Eight cases (19%) needed opening of the drainage system during surgery to lower the intracranial tension. In the postoperative period, twelve cases (28.5%) needed opening of the EVD for the persistence of hydrocephalus, occurrence of CSF leak or bloody CSF. Only eight cases (19%) needed permanent CSF shunting, seven of which were ependymomas and medulloblastomas. None of the cases in this series acquired any EVD related infection, nor did those who required subsequent permanent CSF diversion.

Abbreviations: PFT, posterior cranial fossa tumors; CSF, cerebrospinal fluid; ICP, intracranial pressure; EI, Evans index; EVD, external ventricular drainage; VRI, ventriculostomy-related infection; IVH, intraventricular hemorrhage; ETV, endoscopic third ventriculostomy.

* Tel.: +20 1223317881.
E-mail address: hosamhabib@gmail.com

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Conclusion: Intra-operative insertion of EVD catheter during surgery of posterior fossa tumors, as it allows better control of the ICT during surgery if needed, provides a life saving emergency CSF drainage outlet if tumor resection fails to resolve HC or for the occurrence of de novo HC, and finally it provides adequate control of CSF leak in cases with supratentorial ventriculomegaly, where the use of lumbar drains may be hazardous. Intraoperative drainage prevents possible complications met with early CSF diversion. But the application of this technique should better be restricted to midline posterior fossa tumors related to the ventricular system.

Treatment of hydrocephalus in association of posterior cranial fossa tumors remains a matter of controversy; whether to perform cerebrospinal fluid (CSF) diversion prior to tumor resection, or to perform direct tumor resection, as spontaneous resolution of the hydrocephalus might be excepted. A patient presenting with hydrocephalus in association of a posterior fossa tumor; may be considered to have two distinctly different pathologies which complicate one another and contribute to the complex picture of increasing intracranial pressure (ICP): (1) the lesion itself, and (2) hydrocephalus.[1] Changes in cerebral blood flow that results from an increase in ICP and ventricular dilatation must also be considered in the pathogenesis of disease.[1]

Cushing used to place separate burr holes routinely in the operations on the posterior fossa tumors to drain the ventricles, in an attempt to prevent the life threatening effects of hydrocephalus.[2] Many surgeons advocate shunting procedures prior to tumor resection, with improvements in the preoperative diagnosis of hydrocephalus.[3–7] Other authors refrain from ventricular decompression, as it may result in sudden decrease in ICP, and some cases have been reported to develop epidural or intra-tumoral hematoma, which may have ominous consequences. These complications of shunting have raised the question of its application and they suggested that preoperative shunting makes the subsequent tumor excision even more difficult and hazardous, so they suggest that preoperative shunting for posterior fossa tumors is not frequently indicated, as only a portion of the cases that have not undergone preoperative shunting will need it after the operation.[8–10]

External ventricular drainage (EVD) has been considered one of the options in the management of hydrocephalus, in patients with posterior fossa tumors. However, the main disadvantage of EVD is the risk of contracting a ventriculostomy-related infection (VRI), which has been reported to affect 0.0–21.9% of patients.[11–16] Many modifications in the technique and duration of EVD application have greatly minimized this risk.[17–21]

1. Aim of the work

The aim of this study is to assess the risks and benefits associated with routine intraoperative insertion of external ventricular drainage (EVD) catheters in patients with PFT presenting with hydrocephalus.

2. Patient and methods

Forty two patients with posterior fossa tumors with secondary hydrocephalic ventricular dilatation were included in this study, from the year 2007–2013. The aim of this study was to assess the risks and benefits associated with routine insertion of EVD in such cases.

The location of the EVD was calculated on an individual basis depending on the measurements obtained from patients' radiological studies, then prior to patient positioning the site EVD burr-hole, midline and the cranio-caudal trajectory were marked on the patients scalp, to minimize the three dimensional and anatomical orientation confusion following positioning and draping of the patient. All patients were operated upon in prone or three quarters prone position. After finishing the bony work of both the posterior fossa and the EVD burr-hole, the posterior fossa dura is then opened, before opening the EVD burr-hole dura and attempting ventricular taping, to minimize the risk of upward conning and time to tumor exposure. Once intraventricular location of the catheter is confirmed by the least amount of CSF egress, the tube is then tunneled a distance of more than 5 cm to emerge through a separate incision away from that of the burr-hole incision and is attached to the collecting system. The external drainage system is kept closed intra-operatively unless other measures to lower the intracranial tension failed; where it is temporarily opened till adequate tumor removal, then it is re-closed at the end of the procedure. In cases where there was intraventricular hemorrhage (IVH), CSF drainage is permitted till it becomes clear.

The drainage system is kept closed to allow the build of the normal CSF pressure to maintain normal flow. If the patient developed signs of increasing ICT, deterioration of the level of consciousness or the occurrence of CSF leak, a computed tomography is performed to detect the cause. The collecting device is opened in case of persistence of hydrocephalus till definitive CSF diversion procedure is performed and also in case of CSF leak whether or not due to hydrocephalus till cessation of the leak.

3. Results

The most common age group affected was between 3 and 12 years amounting for 78.5%, as 33 patients had pediatric posterior fossa tumors. Five patients (12%) were above the age of 50 years; three cases of solitary cerebellar metastasis (two cases with tumor apoplexy with bleeding extending to 4th and 3rd ventricles), and two cases of tentorial meningiomas. Three cerebello-pontine angle and a fourth ventricular tumor, were in the fourth and third decades. In our series 29 (69%) were males and 13 (31%) were females, with a male to female ratio of 2.2:1. In the pediatric group, headache was the most common presentation in 75.7% of patients, followed