

LETTER TO EDITOR

Intraventricular hemorrhage: A catastrophic complication after removal of old ventriculoperitoneal shunt

Sir,

We would like to report a case of massive intraventricular hemorrhage arising due to removal of an old ventriculoperitoneal (VP) shunt. Intraventricular hemorrhage is a serious but relatively rare complication that can be avoided to a certain extent by taking a few measures. The bleed is hypothesized to be due to traction and tearing of the choroid plexus or the ventricular wall.

A 12-year-old female who was diagnosed as having Chiari I malformation with hydrocephalus had undergone a ventriculo-peritoneal (VP) shunt in another hospital five years back. She presented to us with complaints of intermittent fever, severe holocranial headache, vomiting and progressive deterioration of sensorium of one week duration. On examination, she was drowsy, opening eyes to call, confused but was obeying commands. Right pupil was dilated and fixed, and the left pupil was 2 mm in size and was reacting to light. Fundi showed bilateral papilledema. She was moving all four limbs spontaneously. Computed tomography (CT) brain showed dilated ventricular system with periventricular lucency [Figure 1]. The shunt was seen *in situ* with its tip in the right lateral ventricle. In view of high fever and rapid deterioration of sensorium, shunt malfunction secondary to an infection was suspected and her shunt was exteriorized and converted into an external ventricular drain (EVD). Cerebrospinal fluid (CSF) was sent for analysis and she was started on intravenous antibiotics. After three CSF culture reports excluded bacterial growth, she was planned for a VP shunt on the opposite side. Under general anesthesia, she underwent left VP shunt and removal of the right ventricular catheter, which was functioning as an EVD. No resistance was felt during removal of the old ventricular catheter. In the postoperative period, she complained of severe headache and nausea. An urgent postoperative CT scan revealed massive intraventricular hemorrhage and the new shunt catheter was seen in the left ventricle outside the blood



Figure 1: Preoperative computed tomography brain plain study, showing dilated ventricular system with right ventricular catheter *in situ*



Figure 2: Postoperative computed tomography brain plain study showing intraventricular hemorrhage with the new left ventricular catheter *in situ*

cast [Figure 2]. However, the ventricular size had reduced and the periventricular lucency had disappeared indicating a functioning shunt. Since she improved in sensorium and also because the scan showed reduced ventricular size, she was managed conservatively with continuous monitoring. She gradually improved further, and her symptoms resolved completely.

Intraventricular hemorrhage is one of the catastrophic complications that can occur during removal of ventricular catheter of a VP shunt.^[1-4] Hemorrhage can occur due to rupture of dense adhesions between ventricular catheter and the choroid plexus or ventricular wall.^[1,4] This complication can be prevented by taking a few simple measures during removal of the ventricular catheter of the shunt tube. When resistance is felt during ventricular catheter removal, dural adhesion should be carefully freed from the catheter and the ventricular catheter

is grasped with a hemostat and rotated.^[1,4,5] This maneuver may free the catheter from the choroid plexus. If resistance persists, the metal stilette that accompanies a new catheter should be inserted into the lumen of the retained tube and a monopolar cautery should be used on the stilette for several seconds. The catheter is then gently rotated through a 360° turn.^[1-5] Coagulation can also be applied to a flexible monopolar endoscopic electrode introduced into the lumen of the tube.^[1,2,4,5] It has an advantage over the stilette of being malleable and hence can be used in cases where the catheter does not follow a straight course within the ventricular cavity.^[2,4] This technique will usually coagulate the choroid plexus at the tip of the catheter and release it.^[1-4] If resistance persists, the catheter should be left in place, a new burr hole should be made, and a new ventricular catheter pathway should be utilized.^[5] In the case of shunt infection, intraventricular endoscopy may be particularly useful to remove the ventricular catheter which is densely adherent to choroid plexus and is not coming out with the described maneuvers.^[5] The adherent choroid plexus can be coagulated and freed from the ventricular catheter using the working channel of the endoscope.^[5]

Our case is unique due to the fact that no resistance was felt during the removal of the shunt and yet the patient developed postoperative intraventricular hemorrhage. After shunt revision, if a patient complains of severe headache and has multiple episodes of vomiting or develops any new sign of raised intracranial pressure, the patient should be evaluated immediately with a CT scan of the brain to rule out intraventricular hemorrhage. The above-described maneuvers should be carried out during removal of ventricular catheter at shunt revision to minimize the incidence of intraventricular bleed.

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