

Article

# Burr hole site acute extradural hematoma after ventriculoperitoneal shunt surgery: a rare case report and its pathogenesis

Prajapati Hanuman Prasad, Singh Deepak Kumar, Singh Rakesh Kumar, Ahmed Faran, Chhabra Anuj  
INDIA



DE GRUYTER  
OPEN

## **Burr hole site acute extradural hematoma after ventriculoperitoneal shunt surgery: a rare case report and its pathogenesis**

**Prajapati Hanuman Prasad, Singh Deepak Kumar, Singh Rakesh Kumar, Ahmed Faran, Chhabra Anuj**

Department of Neurosurgery, Dr RML IMS Lucknow Uttar Pradesh, INDIA

**Abstract:** Ventriculoperitoneal (VP) shunt, a common neurosurgical procedure, has a long list of known complications associated with it. A rare but dangerous complication of VP shunt procedure is extradural hematoma (EDH). It can be diagnosed and managed easily before it turns into a catastrophic complication.

**Key words:** Extradural hematoma, Ventriculoperitoneal shunt, Pathogenesis

### **Introduction**

Ventriculoperitoneal (VP) shunt is a commonly performed neurosurgical procedure, also has the longest list of postoperative complications. The most common site of EDH is on fronto-parietal region. This may be due to loose fixation of the dura to the cranial vault at this region [1].

VP shunt causes sudden decompression of the brain that can lead to either subdural hematoma (SDH) or EDH formation. Formation of EDH is relatively rare in comparison to SDH. Very few cases of post-VP shunt EDH formation have been reported in the literature. We report this case to spread awareness of this relatively rare complication of a very common neurosurgical procedure, which, in some cases, can be avoided, and, in all cases, can be diagnosed and managed easily before it turns into a catastrophic complication.

### **Case Report**

A 12 years old patient presented to us with complain of headache, vomiting and imbalance while walking from last 6months. Headache and vomiting become severe from last 10 days. On examination patient was conscious and oriented his cranial nerve, motor and sensory system examination was normal. Cerebellar signs was positive on both side. CT brain was suggestive of fourth ventricle mass with obstructive hydrocephalus. Right sided medium pressure ventriculoperitoneal shunt was done Post operatively patient was relieved from headache and vomiting.

On third post op day patient again develop headache MRI brain with contrast was done MRI brain shows fourth ventricle mass with right fronto parietal acute EDH with right

sided shunt in situ. Patient was planned for surgery and right fronto parietal craniotomy with suction evacuation of acute EDH was done. After two weeks patient was planned for definitive surgery.



Figure 1



Figure 2

## Discussion

Ventricular shunting to treat hydrocephalus is a very common neurosurgical procedure worldwide. Complications such as obstruction of the device and infection are more frequent than bleeding [2, 3, 4]. After shunt surgery, development of SDH are more common than EDH. Development of EDH after shunt surgery are very rare and only few cases are reported in literature.

On reviewing the literature we found that there are various mechanism described for

post shunt surgery EDH formation, but the exact mechanism is not clear. The most proposed mechanism for hematoma formation after ventricular decompression is sudden lowering of intra-cranial pressure, which results in a suction force on structures between the cortex and the inner table of the skull [5]. SDH develop because of tearing of cortical bridging veins and meningeal vessels tearing leads to formation of EDH. In case of EDH, detaching the collagenous fixation of the dura from the inner table of the skull may initially cause the dural and diploic veins to bleed into the epidural space. As the hematoma enlarges and the distance between the dura and the bony arterial channels increases, the dural arteries may also tear.

Second mechanism is that the traction exerted on the dura mater during insertion of shunt causes a displacement and make the vessels between the membrane and the skull to be torn. This is supported by the fact that most reported cases occur in children, in whom the dura is less tightly adhered to the skull than in adults.

In case of EDH directly adjoining the burr hole site of VP shunt, excessive coagulation of dura of the burr hole before dural incision, in some cases, may cause enough shrinkage to result in dural separation from the skull and EDH formation. This dural separation is further aided by rapid lowering of intracranial pressure. Once bleeding has begun by any mechanism, arterial bleeding into the resulting pocket creates a hydraulic “water press” effect, progressively stripping away the dura from the skull and widening the perimeter of the hematoma.

EDH developing post operatively usually causes symptoms during or immediately after surgery. However, the diagnosis may be delayed in a case with VP shunt insertion because of a reduction in CSF volume in the ventricles via a properly functioning shunt [6]. The most common initial symptom is a headache, and there may be seizures in delayed cases [6].

Post-shunt EDH can be managed surgically and conservatively. The choice between a surgical or a non-surgical treatment of post-shunt EDH requires the evaluation of various factors: Volume, thickness, midline shift and amount of fresh blood present on CT scan, and the clinical picture. In our case, because the patient was symptomatic with MRI brain findings of mass effect and midline shift, we considered the patient for surgical intervention. Right fronto parietal craniotomy with suction evacuation of EDH done. After two weeks patient was planned for definitive surgery.

Minimal CSF spillage at the time of ventricular catheter insertion, meticulous surgical technique, use of high- or medium-pressure valves or differential pressure valves, slow return to upright position and close follow-up even including a postoperative CT scan help to minimize the bleeding complications after VP shunting [7].

Use of valve-regulated shunt systems has lowered the incidence of SDH and EDH after ventricular drainage. There are only 18 cases of epidural hematomas after valve-regulated shunt placement in the literature [8]. Most of these cases had acute hematomas, and only five of them had chronic calcified/ossified

hematomas. These patients were 15-35 years old. EDH contralateral to the VP shunt has been also described [9].

The largest case series of epidural hematoma after ventricular decompression, from Otake and Matsumoto[9], includes not only ventriculoperitoneal shunt but also other procedures for draining cerebrospinal fluid: ventricular puncture, ventriculography, ventriculoatrial shunts leading to development of EDH after the procedure.

We suppose that in our case, the mechanism appears is sudden decompression of the dilated ventricles, stripping the dura from the bone and leading to the acute epidural hematoma. Furthermore, the long hydrocephalus associated with lower thickness of the left brain parenchyma, have contributed to the event.

## Conclusion

EDH as a complication of ventriculoperitoneal shunt is a rare but dangerous complication which, in some cases, can be avoided, and, in all cases, can be diagnosed and managed easily before it turns into a catastrophic complication.

## Correspondence

*Dr. Hanuman Prasad Prajapati*  
*Department of Neurosurgery, Dr RML IMS*  
*Lucknow, Uttar Pradesh (India)*  
*Email: pushpa84.dhp@gmail.com*

## References

1. Higazi I. Epidural hematoma as complication of ventricular drainage: Report of a case and review of literature. *J Neurosurg.* 1963;20:527-528. [PubMed]

2. Louzada PR, Requejo PR, Barroso MV, Vaitsman RP, Machado AL, Paiva MS, Salame JM. Bilateral extradural haematoma after acute ventricular over-drainage. *Brain Injury*. 2012;26:95–100. [PubMed]
3. Driesen W, Elies W. Epidural and Subdural Haematomas as a Complication of Internal Drainage of Cerebrospinal Fluid in Hydrocephalus. *Acta Neurochir (Wien)* 1974;30:85–93. [PubMed]
4. Chen GM, Cai T. Clinical analyses of complications after ventriculoperitoneal shunt in 125 cases. *Di Yi Jun Yi Da Xue Xue Bao*. 2004;24:1078–1079. [PubMed]
5. Wolfsberger S, Gruber A, Czech T. Multiple supratentorial epidural haematomas after posterior fossa surgery. *Neurosurg Rev*. 2004;27:128–32. [PubMed]
6. Seyýthanoglu H, Guzey FK, Emel E, Ozkan N, Aycan A. Chronic ossified epidural hematoma after ventriculoperitoneal shunt insertion: A case report. *Turk Neurosurg*. 2010;20:519–23. [PubMed]
7. Yue CP, Mann KS. Fluid chronic epidural haematoma. A rare complication of ventriculoperitoneal shunt. *J Neurol Neurosurg Psychiatry*. 1985;48:953–5. [PMC free article] [PubMed]
8. Paiva WS, Oliveira AM, De Andrade AF, Brock RS, Teixeira MJ. Remote postoperative epidural hematoma after subdural hygroma drainage. *Case Report Med* 2010. 2010:417895. [PMC free article] [PubMed]
9. Jain SK, Sundar IV, Sharma V, Arora R, Prasanna KL. Chronic ossified extradural hematoma on the opposite side of the ventriculoperitoneal shunt procedure: A rare case report. *Saudi J Health Sci*. 2012;1:159–61.