Case Report

An Unusual Mechanism of Delayed Intracerebral Hemorrhage After Ventriculoperitoneal Shunting: Case Report

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Summary

We present a case of delayed intracerebral hemorrhage that developed seven years after initial ventriculoperitoneal shunt surgery. A seven-year-old boy was admitted to emergency when he experienced sudden headache and vomiting. Computed tomography (CT) scanning showed an intracerebral hemorrhage around the ventricular catheter that cannot be explained by known predisposing factors such as head trauma, coexisting bleeding disorder, occult vascular malformation, and intratumoral hemorrhage. The presumed mechanism in this case is that the ventricular catheter caused contusion of cerebral tissue because the shunt tube at the neck had stretched during the growing up of the child.

Key words: Ventriculoperitoneal shunting, intracerebral hemorrhage, delayed

INTRODUCTION

Ventricular shunting procedures are frequently used in neurosurgical practice, so the complications are thought to be well known. Shunt infection and malfunction, seizures, subdural haematoma and, although rarely, intracerebral hemorrhage were mentioned in the literature(1,6,12). Here we discuss a causative mechanism of delayed intracerebral hemorrhage, which developed seven years after initial surgery.

CASE PRESENTATION

A seven-year-old boy was admitted to emergency when he experienced sudden headache and vomiting. He had no history of head trauma or bleeding disorder. His
medical history revealed that he had undergone a ventriculoperitoneal shunt operation at the age of one month because of congenital hydrocephalus. Neurological and physical examinations were normal, except for findings such as marked superficial positioning and tethering of the shunt tube at the neck, which indicated that stretching had occurred. X-Rays revealed that the shunt system included a ventricular catheter, a valve and a distal catheter with continuity.

Computed tomography (CT) scanning showed hemorrhage around the ventricule catheter at the right parietal lobe, without any hydrocephalic appearance (Figures 1a and 1b). Magnetic resonance (MR) imaging also indicated acute hemorrhage around the catheter, without any marked vascular malformation (Figure 2). MR angiography and laboratory investigations, including coagulation tests, were normal. The patient was managed conservatively and discharged free of symptoms two weeks after admission. CT scanning was done two months later, and there was no evidence of hemorrhage.

**Figure 1a,1b:** CT scan showed acute intracerebral hemorrhage around the ventricular catheter and no reservoir at the burr hole.

**Figure 2:** T2 weighted MRI showed hypointense signal of hemorrhage around the ventricular catheter.
DISCUSSION

There are many reports of complications following shunt procedures. We know that complications such as infection, obstruction, malfunction, seizures, overdrainage, subdural haematoma and intracerebral hemorrhage can develop in both the early and the late period after the initial shunt operation\(^{(1,2,6,12)}\). Some of these complications might be able to be prevented by using surgical techniques properly and following basic surgical rules. The present case involves an intracerebral hemorrhage that is believed to have been caused because the shunt tube at the neck stretched, probably due to more superficial positioning of the tube rather than to subcutaneous plane. To prevent superficial positioning of the shunt tube, a subcutaneous tunnel can be created in two or three stages rather than one.

Although small and asymptomatic intracerebral hemorrhage along the catheter pathway can occur soon after ventricular cannulation, a few reports have indicated that a delayed intracerebral hemorrhage can arise after shunt placement, although this is not a common condition\(^{(1,2,4,5,7,8,9,10,11)}\). According to the literature, delayed intracerebral hemorrhage has been reported between six and 13 days after the initial shunt operation\(^{(1,2,4,5,8,10,11)}\). In our case, the CT scan showed a small hemorrhage around the catheter that developed seven years after surgery. To our knowledge, there have been no other case reported after such a long period of time.

The possible causes of intracerebral hemorrhage after shunt placement include head trauma, shunt-induced disseminated intravascular coagulation, coexisting bleeding disorder, occult vascular malformation and intratumoral hemorrhage\(^{(1,5,8,10,11)}\). According to patient history, laboratory examination and radiological findings, none of these factors could explain the source of hemorrhage in our case. The intracerebral hemorrhage along the catheter pathway can be occurred during either removal or placement of the ventricular catheter\(^{(3,12)}\). In these cases, the hemorrhage pattern is usually punctate as in our case. However, migration of the ventricular catheter is not common because the reservoir part of the shunt system is usually fixed to the pericranium. The fixation is more convenient with burr hole design reservoir, however, if flat type reservoir is used, it may not be possible to fix and it is usually put under the occipital scalp, beneath the skin incision. This situation may allow catheter migration. In the presented case, the type of reservoir of the shunt system was flat, so the ventricular catheter maybe subjected to the pull force because the shunt tube stretched at the neck as the child grew and eventually cause a disruption of cerebral blood vessels. Fibrosis around the catheter might have participated in this disruption. In our knowledge, the type of punctate hemorrhage around the ventricular catheter supports our theory.

Intracerebral hemorrhage after shunt placement is not an indication for shunt revision. Our case involved a small intracerebral hemorrhage without any hydrocephalic appearance or evidence of shunt malfunction or disconnection. Therefore, we did not perform any surgical intervention. However, surgical treatment should be performed if the hemorrhage is life-threatening.

In conclusion, delayed intracerebral hemorrhage can be seen after the shunting procedure, but it has not previously been reported seven years after the initial surgery. The proper use of surgical techniques can prevent such unexpected complications.
REFERENCES